DRAGON USER



The independent Dragon magazine

75p US$3.25 January 1985

Who is KING of the HILL?

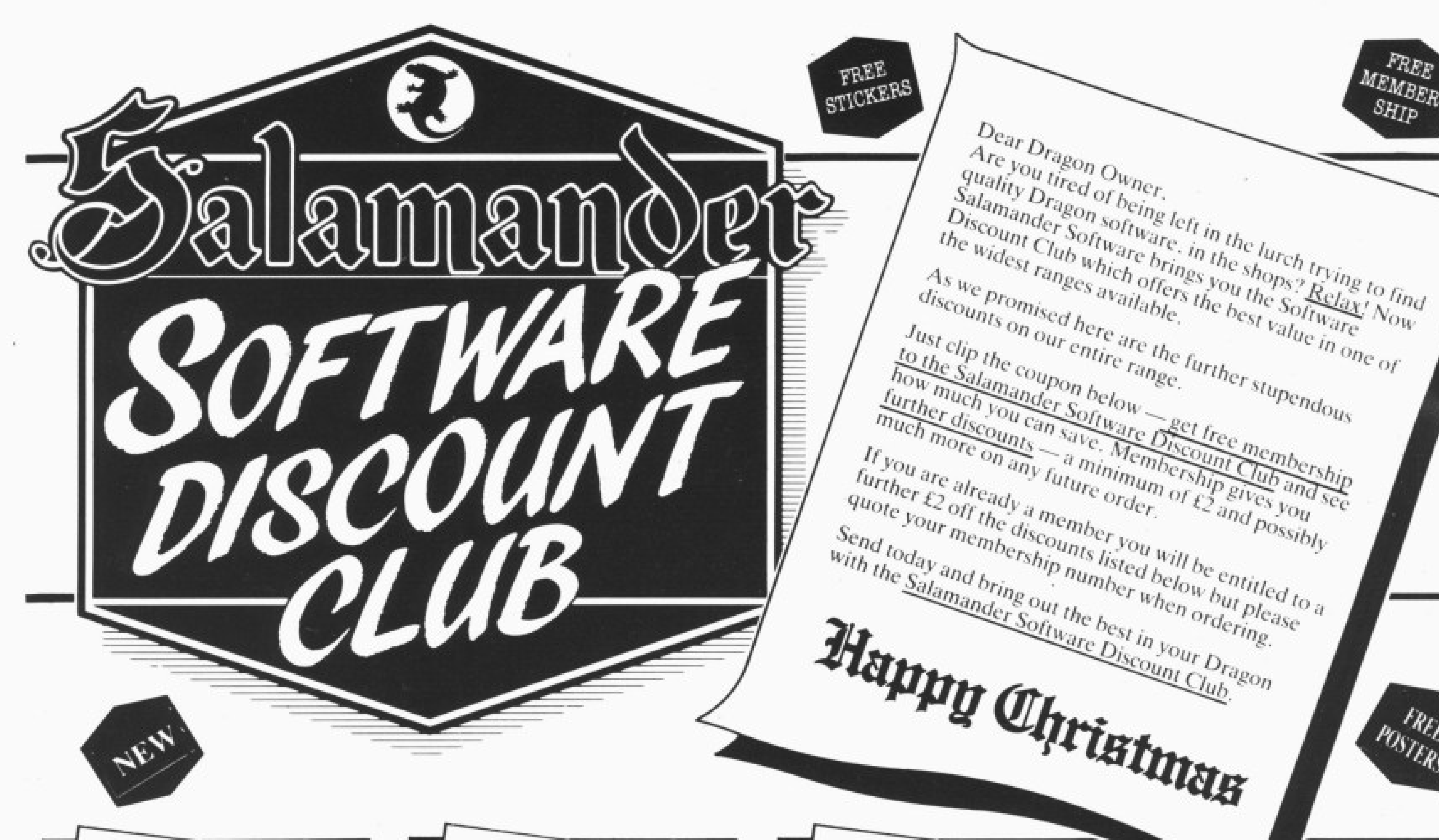
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How to submit articles

The quality of the material we can publish in *Dragon User* each month will, to a very great extent depend on the quality of the discoveries that you can make with your Dragon. The Dragon computer was launched on to the market with a powerful version of Basic, but with very poor documentation.

Articles which are submitted to *Dragon User* for publication should not be more than 3000 words long. All submissions should be typed. Please leave wide margins and a double space between each line. Programs should, whenever possible, be computer printed on plain white paper and be accompanied by a tape of the program.

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your program returned you must include a stamped, addressed envelope.

Contents



Editorial

IF THE 6809 show has any message at all, it is that the Dragon is not dead yet. Rumours of the Dragon market's imminent demise, which have been rife since Dragon Data folded, are somewhat exaggerated.

There was an excitement about the 6809 show not seen since the early ZX Microfairs, when the Central Hall at Westminister was filled with wall-to-wall people. Software and books, admittedly on offer at discount prices, were shifting like there was no tomorrow. But then many Dragon owners are worried that there will be no tomorrow.

Dragon's future has been the subject of considerable debate ever since Dragon Data went into receivership and sold the manufacturing rights to the 32 and 64 to Spanish company Eurohard. The pundits have been predicting a rapid end to the machine, with software companies refusing to support a dwindling market.

Certainly the retail chains have emptied their shelves of Dragons and Dragon software as fast as possible. Equally, those software companies specialising in the Dragon have been converting their programs to other machines. Few of them are writing new Dragon programs. Commodore, Sinclair, Acorn and Amstrad are the 'hot' machines now.

Nevertheless, the Dragon has undergone something of a mini-revival in recent weeks. Stores anxious to rid themselves of unwanted machines have found cut-price Dragons being snapped up by bargain hunters. Similarly, mail-order software houses have seen a resurgence in business as Dragon owners discover they can no longer by software in their local stores.

Perhaps the most encouraging news comes from Eurohard's plan to sell an enhanced 64 in the UK. Whatever the size of the existing Dragon user base, the machine will only have a long-term future if it is followed by new models.

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Letters

This is the chance to air your views — send your tips, compliments and complaints to Letters Page, *Dragon User*, 12-13 Little Newport Street, London WC2H 7PP.

Missing manual

I PURCHASED a Dragon 32 secondhand and the previous owner lost the instruction manual. If any reader has a spare manual or doesn't use their manual and would be willing to part with it I'd be grateful if they would get in contact with me.

B Elder
8 Longrove
Treforest
Pontypridd

Smooth operator

WITH reference to the rotator program by Neil Blagden in the November issue of *Dragon User* (Open file section) I would like to improve on the program by making the 3-D graphics smoother.

Load or type in the program as listed in November, and then type in the following lines of program:

```
1 PCLEAR 8: PMODE 4,5:PCLS
365 PMODE 4,5
465 FOR N=1 TO 4: PCOPYN+4
TO W: NEXT N
490 PMODE 4,5: PCLS
595 PMODE 4,5
705 FOR N=1 TO 4: PCOPYN+4
TO N: NEXT N
760 PMODE 4,5: PCLS
```

The program will now draw the frame of the cube or triangle on page five then copy it to page one. The effect finishes the program off well.

Leon Rees
Leicestershire

In search of Trackers

WE HAVE had a fantastic response from readers to our offer for Back Track using the £1.50 off token published in the October issue of *Dragon User*. However, we have received some orders that we are unable to send as all we have received is a postal order and the coupon with no name and address.

Any readers who have sent a postal order to Incentive and have yet to receive their copy of Back Track please either write to me at the address below, or phone me on 0734-591678 giving details of their home address and the Post Office from which they obtained their postal order, so that I can clear up these orders and send off copies of the game.

Darryl Still
Operations Manager
Incentive Software
54 London Street
Reading RG1 4SQ

Twist or stick

MANY THANKS for your review of Cecil Plays 21. Having taken Brian Cadge's comments very much to heart we have immediately corrected the faults.

As we have sold a number of these tapes we do feel a responsibility to our customers and would like to inform them that anyone who has a copy of Cecil Plays 21 can return it to us as we will, by return of post, send out not only a corrected version but also another one of our games by way of compensation.

Howard Davies
Snip Software
PO Box 20
Woking
Surrey GU21 3QN

Scramble to the rescue

I HAVE had several inquiries regarding my program Scramble, Scramble published in the October issue of *Dragon User*. Most problems are caused by incorrect data entries in lines 2970-3130. The program is correct as listed, however, any readers having problems can send me (c/o *Dragon User*) a blank tape and a large SAE for a free copy of the program.

Steve Gathercole

Function key routines

I WAS interested to read Peter Whittaker's article on function key routines in the October issue of *Dragon User*. I have been experimenting with his method of calling Basic ROM routines, and found that for some routines at least, it does not work. Inspection of the ROM instructions at their entry points shows why: these routines need not the token, but the next character *after it*, to be loaded into the A register. Also, the CC register is unimportant and does not need to be set with ANDCC #$FE in the ones I have tried. Below is a listing that calls the ROM routines in sequence. To execute type:

PMODE4: PCLS:SCREEN1,1: CIRCLE(128,96),95.

The technique can also be used with other languages. I use it to call Basic functions from FORTH as my MICROTANIC FIG NORTH 1.1 does not have Basic calls, but does allow machine code calls using JSR.

Dr John Nash
West Kirby
Merseyside

```
7530           00100        ORG  30000
7530 9E A6     00110 START  LDX  $0A6
7532 34 10     00120        PSHSX
7534 8E 755B   00130        LDX  #TOK1
7537 9F A6     00140        STX  $0A6
7539 A6 B4     00150        LDA  ,X
753B BD A9AF   00160        JSR  $A9AF
753E 4F        00170        CLRA
753F BD A8C0   00180        JSR  $A8C0
7542 8E 755D   00190        LDX  #TOK2
7545 9F A6     00200        STX  $0A6
7547 A6 84     00210        LDA  ,X
7549 BD A9FE   00220        JSR  $A9FE
754C 8E 7561   00230        LDX  #TOK3
754F 9F A6     00240        STX  $0A6
7551 A6 84     00250        LDA  ,X
7553 BD B238   00260        JSR  $B238
7556 35 10     00270        PULSX
7558 9F A6     00280        STX  $0A6
755A 39        00290        RTS
755B      3400 00300 TOK1   FDB  $3400
755D      312C 00310 TOK2   FDB  $312C
755F      3100 00320        FDB  $3100
7561      2831 00330 TOK3   FDB  $2831
7563      3239 00340        FDB  $3239
7565      2C39 00350        FDB  $2C39
7567      3629 00360        FDB  $3629
7569      2C39 00370        FDB  $2C39
756B      3500 00380        FDB  $3500
          0000 00390        END
00000 TOTAL ERRORS
START  7530
TOK1   755B
TOK2   755D
TOK3   7561
```

Software Top 10

1	(1)	**Hunchback**	Ocean
2	(3)	**Hungry Horace**	Melbourne House
3	(8)	**Dragon Chess**	Oasis
4	(2)	**Mystery of the Java Star**	Shards
5	(7)	**Chuckie Egg**	A & F
6	(4)	**Mr Dig**	Microdeal
7	(5)	**Cuthbert in Space**	Microdeal
8	(6)	**Kriegspiel**	Beyond
9	(–)	**Bug Diver**	Mastertronic
10	(–)	**Sprite Magic**	Knight Software

Chart compiled by Websters Software

Bulletin boards

CAN anybody provide me with details of bulletin boards (either free access or charged access) suitable for use with the Dragon. Also, any person interested in setting up a bulletin board for the Dragon in my area can contact me at 8 Knights Hill, Severn Stoke, Worcestershire.

D A Sutton
Worcs

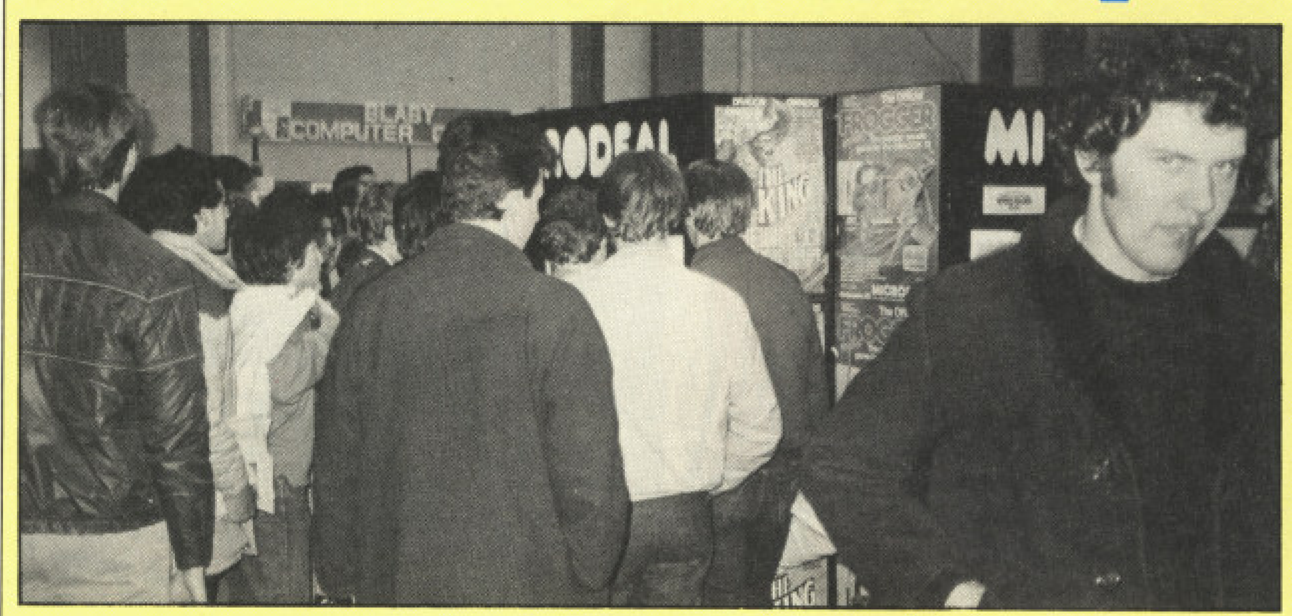


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6809 round-up



JUST OVER 7,000 people attended the 6809 show for Dragon and Tandy Users held recently at the Royal Horticultural Halls in London. Queues formed early on the first day and at one stage it was impossible to move between the Blaby and Microdeal stands as enthusiasts sought to do battle with the latest games on display.

Most major Dragon companies had a stand, although Touchmaster and Eurohard SA, the Spanish manufacturer of the Dragon, were notable by their absence. Eurohard did, however, donate four Dragon 64's as prizes for a raffle, and had two senior officials in attendance.

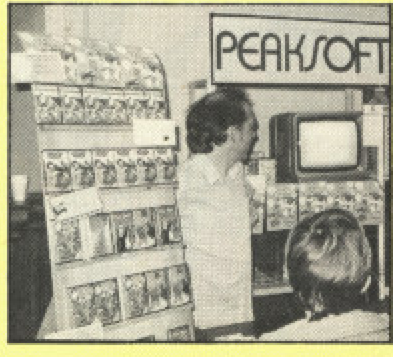
The winners of the raffle were: Daniel Soto of London, J J Alexander of Staffs, J H Bellingham of Surrey and J Bailey of Doncaster.

Most exhibitors did a thriving trade, with a number of software companies running out of stock on selected titles. John Symes, managing director of Microdeal said that an extra shipment of its latest release, Ice Castles, had to be sent up on Saturday, and this quickly sold out on Sunday. "Everything sold well," said John, "even notebooks and T-shirts."

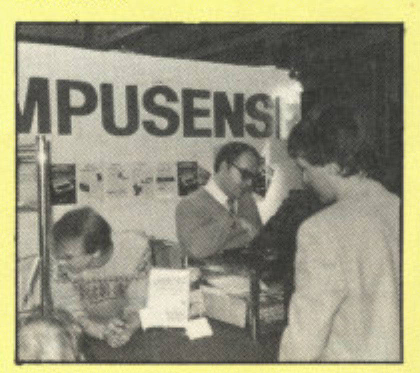
Microdeal also announced that 19 of its titles will now work on both the Tandy and the Dragon. These include its new releases, Speed Racer, Worlds of Flight, Ice Castles, Draconian, Demon Seed and Chambers together with four of Shards titles that Microdeal is distributing. They are: Pettigrews Diary, Operation Safras, Mystery of the Java Star and Empire.

Computer Marketplace, the show organisers, announced that they hope to have another 6809 show in March, either at the University of Manchesther or at the Horticultural Halls in London.

CHANNEL 8 Software was selling its Mysterious Adventure series. Three new titles: Midwinter, After the Fire and Beyond the Infinite are also to be converted to the Dragon, completing the series. Pictured above are Channel 8's Norman Perrian (right) and John Williams, with Adrian Harradence, winner of the Mysterious Adventure raffle.



HARRY WHITEHOUSE of Peaksoft watching Tim Love's cricket competition. The winner was Graham Warder who obtained a score of 118 — the highest score by a single batsman. Graham won £150 of Dragon software. The runners-up in the competition were Chris Pennington and Edward Schofield.



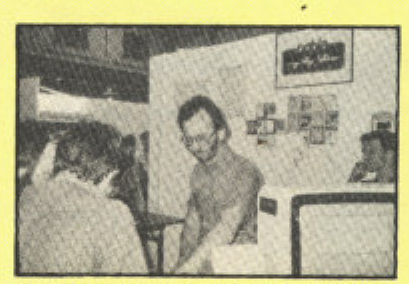
COMPUSENSE, who are to distribute the Dragon in this country (see Eurohard profile, page 19) sold several disk drives and complete systems. All prices were slightly reduced for the show, and Ted Oprychal (centre) said that business was brisk. Large numbers of people were in evidence on both days of the show.



SALAMANDER announced that it may be moving its operation to France. The company was selling its range of titles at marked down prices.



GEOFF JONES (third from left) displaying the capabilities of the new Trojan light pen to an attentive audience.



PETER PHILIPS (centre) of Cable Software with his latest game, Eager Edna, on display. Two other new titles were also on sale.

Dragons at Comet

COMET, the high street retail chain, has obtained stocks of Dragon 32's, 64's and disk drives from GEC.

The Dragon 32 is being sold for £79.99 and the 64 for £129.99. A single disk drive plus controller is going for £179.99.

As a special offer, Comet is also selling the Dragon 64 plus disk drive and controller for £259.99.

Stocks are available at most major Comet stores, and a system exists to handle orders from a branch without stock.

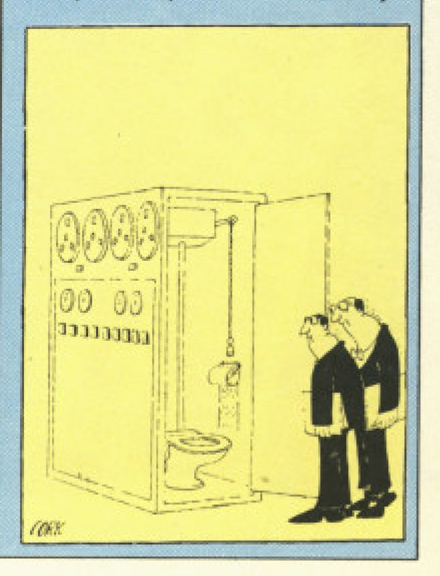
As reported last month in *Dragon User*, GEC has now sold its entire stock of Dragon computers and peripherals. The majority of the stock went to Eurohard after Comet had acquired its share. It is not known what quantities Comet has obtained.

No sign of touch-pad

TOUCHMASTER'S touch-sensitive pad, launched at the *PCW* show in September, had not been made available for the Dragon at the time of going to press.

Review models for the Commodore and Spectrum arrived several weeks ago, but despite intense efforts to obtain a Dragon version nothing has been sent.

George Hynes, Touchmaster's public relations company, at first said that Touchmaster would not be producing a Dragon interface. This statement was later taken back, and both Touchmaster and George Hynes said that a Dragon compatible pad is on the way.



Premier go under

PREMIER microsystems, manufacturer of DeltaDOS, the first disk drive system for the Dragon 32, has ceased trading.

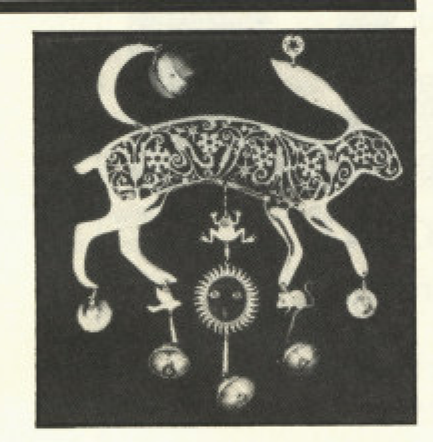
All telephone lines to the company have been disconnected and none of the directors could be contacted at the time of going to press. Lack of sales following Dragon data's demise is thought to be the reason for the wind-up.

Cumana, distributors of Premier's disk system would make no comment as to what had happened, but did disclose that they would be selling off what remaining stock they had. Prices were marked down at the 6809 show.

Ted Oprychal of Compusense said that Compusense will be selling a Flex implementation for Premier's controller.

No further details are available.

Hareraiser



HARERAISER FINALE, the computer program which puts you in search of the Jewelled Hare of Masquerade, is now available for the Dragon 32 and 64. Retailing for £8.95, the program, and its precursor Hareraiser Prelude, are essential for treasure hunters in search of the golden hare.

The hare is worth £30,000 and the winner has the option of either keeping the hare or £30,000. The first person to locate the hidden treasure wins the prize.

Each tape is specially coded and has its own registration number. The winner must produce both tapes, registration number and winning location. Further details from Haresoft on 01-388 3910.

Versatile software

FARMERS and pharmacists are now making use of the Dragon with the arrival of versatile programs from two software houses.

Mumps, a high level structured language which is upwards compatible with minicomputers and mainframes is being used by Thoth Data to market a pharmacy labelling package.

The pharmacy labelling and automated stock recording system works on the Dragon 64 using Ansi standard mumps. The package provides facilities for printing labels for medicines as well as automatic warning instructions to patients for the drugs dispensed. An optional stock check can be held against each product.

The Dragon contains order codes and wholesale pack sizes for 400 stock lines. Products are accessed by typing the first few letters of their name, abbreviations are than automatically expanded and irrelevant prompts are suppressed if extra information is given. Online help is available by answering each prompt with a "?".

Mumps is a block structured language, similar to Logo in structure and modularity, with some commands resembling Basic. It was developed in the late Sixties as a computer operating system and programming language designed to cope with large Hospital Information systems. Its success in coping with this resulted in it being adopted in the business and commercial field. Further details from Thoth Data at 54 Main Street, Cosby, Leicester LE9 5UU.

From Farmfax comes several agricultural programs covering arable and dairy farming. There is a pig program, an individual milk prediction program, management and ration formulation programs, cash accounts and cash planning programs.

Using eproms for its programs, Farmfax adopted the Dragon 32 after looking at 11 home computers, comparing such things as price, chips and ports.

Further details from the company at Farmfax Sales, Steep Marsh, Petersfield, Hampshire.

New software for review should be sent to *Dragon User*, 12-13 Little Newport Street, London WC2H 7PP.

Air attack

Program: Fury, Microdeal, 41 Truro Road, St. Austell, Cornwall PL25 5JE. **Price:** £8.00

ALTHOUGH sprites are not offered as one of the features on the Dragon, games writers are managing to produce them to good effect in some of the recent games I have seen. Fury is one of these, and they first appear in the title frame.



The theme is aerial combat in a cloud-filled sky, for some reason, somewhere in South America. You control a tiny plane in the centre of the screen that does not change its position, merely turning to face a different direction as you move the joystick around. The background moves in the opposite direction to the plane across the screen and this creates the illusion of movement.

Pressing the fire button produces a stream of bullets that go in the direction in which your plane is pointing. These can be aimed at the many enemy gun-ships that come after you, and this naturally increases your score. There are also several parachutes that float gently across the display.

The effect is visually very good, and would look excellent if the Dragon produced sharp colours, but as it is, it shows up best in black and white. If you can cope with the dizziness that comes through staring too long at the fluffy clouds passing by, you may be awarded another aeroplace as yours bites the dust.

I'm not sure about this game; it looks good but doesn't really get anywhere. On one occasion I left the plane pointing at the top of the screen and just kept on firing. Whether I was simply lucky I don't know, but anything that came close disappeared with a bang, my points continued to rise, and I almost gave up after two minutes or so out of boredom. Then suddenly a magnetic mine appeared from nowhere and blew up my remaining plane in seconds — so beware! If you fancy your chances against the Red Baron you may enjoy this game, but I found it a little on the tame side.

John Scriven



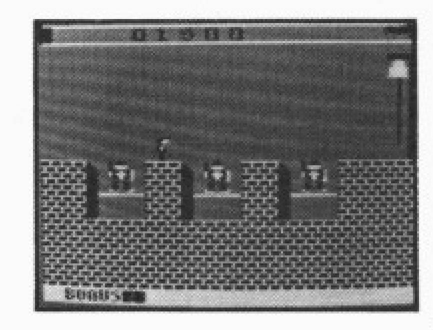
Hunchback

Program: The Bells, Blaby Computer Games, 10 Crossways, Lutterworth Road, Blaby, Leicester. **Price:** £1.99

IT SEEMS that the latest game to get the "Space Invader" treatment is the "Hunchback" type of game. Yet another version, The Bells, has been produced by Blaby Computer Games.

The notable features of this version are that there is both a joystick and keyboard version included on the one tape and that it is VERY fast, so fast that I found it almost unplayable with a joystick, as the merest touch sent Quazimodo halfway across the screen. All the other usual features of Hunchback are here: arrows, guards, and so on. There are 14 screens to get through — I didn't get to the end, so I can't say what happens in this version.

Personally, I prefer Ocean's version of "Hunchback",



which is much more playable and has one extra screen. If you really want a "Hunchback" game then take a look at all of those available — you pays your money . . .

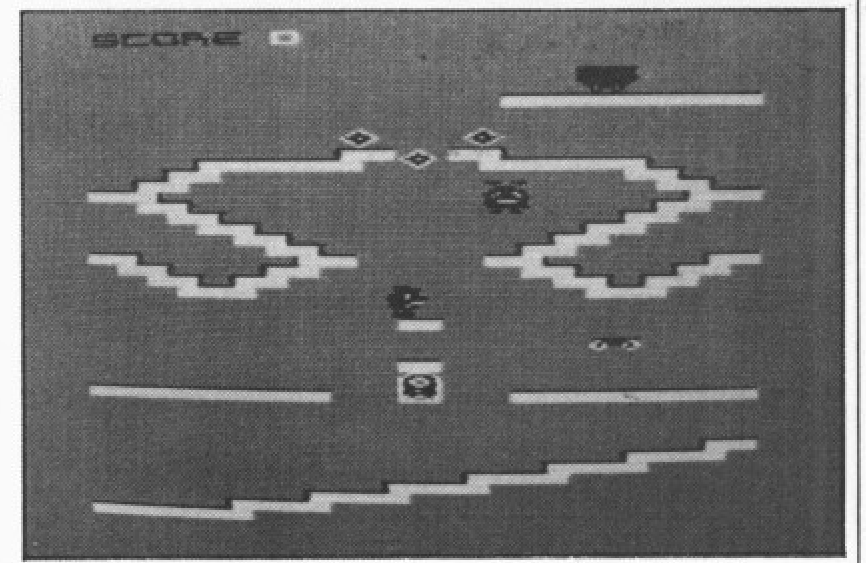
Brian Cadge



Evil Orbis

Program: Perilous Pit, Blaby Computer Games, 10 Crossways House, Lutterworth Road, Blaby, Leicester. **Price:** £1.99

PERILOUS PIT is an arcade-style game set in the rather unoriginal location of a mine. The player has to guide Boris the miner past "The Dreaded Orbis and his Cronies", collect some crystals, and put them in his truck. This is achieved using the joystick to move, and the fire button to jump.



Jumping around too much brings to life The Dreaded Orbis, who turns out to be a little box complete with flashing light, and enjoys nothing more than a quick chase around the crystal mines. Exactly who or what The Indistinct Orbis is, is never explained (it certainly isn't obvious from the graphics) neither is his reason for wanting to keep the crystals mentioned above.

Strangest of all is the fact that while Boris can run around within a pixel of The Inanimate Orbis without the latter batting an eyelid (if he has one), jumping up and down right over the other side of the screen sends The Irritable Orbis into a frenzy.

The graphics are not all they could be: the movement is very jerky and Boris flickers continually. The sound effects during the game are almost non-existent, and those during the title sequence are only up to Basic standard. It should be said, however, that this game does sell for £1.99, and I have seen worse games go for £8 or more, but then that is totally inexcusable. A range of cheap software is a very good idea, but only if the quality is maintained.

David Rowntree



Educational

Programs: Mazerace and Spellbox, P J Paul, The Forelands, Red Lion Street, Chesham, Bucks HP5 1EZ. **Price:** £6.75

BOTH of these programs have been devised to enable children (seven- to 12-year-olds, according to the instructions) to test their knowledge of simple arithmetic and spelling of English words. As such they fall firmly into the "Educational type" of program packages.

The packaging in this case is an ordinary cassette box with a typewritten instruction sheet. The instructions provided both on the sheet and on the program are clear and easy-to-use; however, if children are to use the programs an adult would probably have to read them first and then ▶

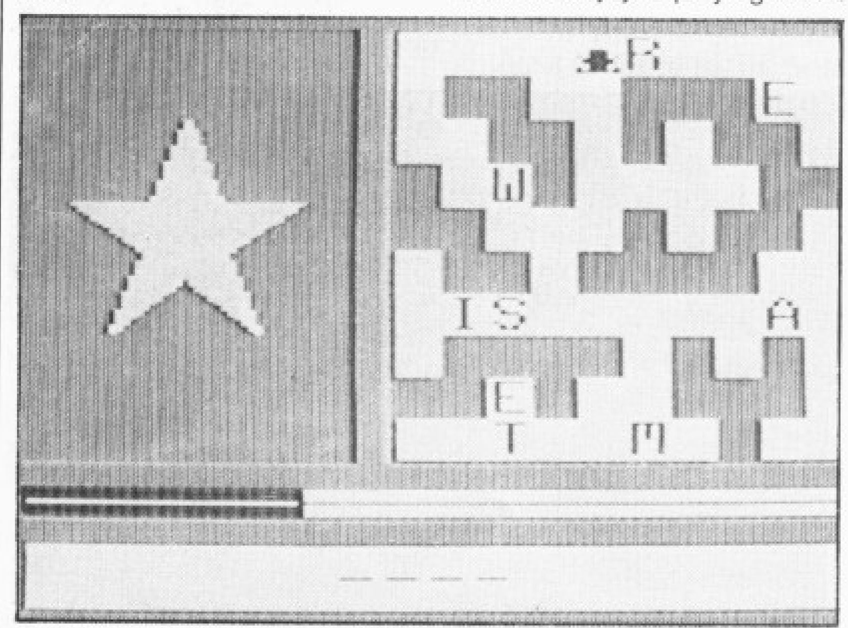
◀ explain how to use them. I found, however, that my seven- to 12-year-olds were able to work out how to use the programs even without the instruction sheet. Now to the programs themselves.

Spellbox is the weaker of the two programs. The screen display appears to be designed to represent a television set production line with a supply of suitably animated working parts. To the accompaniment of suitable noises a placard is lowered on to the "line" on to which either a word or an arithmetic expression is written. The player has a limited length of time to express the view whether the said display is correct or not by depressing the "W" or "X" keys for an incorrect spelling or sum while the "R" or "C" key needs to be pressed if they are considered to be correct.

moved around the maze by means of the cursor keys. When he reaches the desired letter the player must press the spacebar and the letter is entered in the first blank available on the bottom line of the screen. The correct number of blanks are given to spell the required word. More letters are provided than are required to spell the word.

Similarly in the arithmetic version of the program, the player is given a specific task to perform given a number of digits and operators which are to be found in the maze. They are assembled to give the required expression in the same way as the spelling program. In both case the player is corrected upon giving the incorrect answer.

This is quite a good program in that the graphics and sound are attractive and my children enjoyed playing with it



If a set of five questions are answered correctly then the game will proceed to the next level of difficulty. There are six levels in all and it is possible to start a game at any of the levels. This works quite well for the arithmetic problems but falls down on the spelling one in that I found that my children were finding difficulty in deciding what word they were attempting to spell in some cases, as they only had an incorrect rendering of the word as a guide to what it was. There were no pictures to help. However, if a word was incorrectly spelt and the player answered that it was correct, the correct spelling was given.

In the spelling test version of Mazerace the player is given a simple picture together with a maze which contains a number of mobile letters which are "fetched" by a little man who is himself

but it falls down in that it does not give the child any indication of how well, or how badly, he or she is doing. In other words it does not keep a score. This is a great pity as it spoils an otherwise good program.

Both of these programs have been written in Basic, and it is a tribute to Dragon Basic that such graphics can be written using this version on the language. Full use has been made of the colour in PMODE3 and sound facilities. There is little doubt that any child (or even a few adults) could benefit from these programs in order to improve their spelling in particular.

However, sooner or later the child is going to learn all the problems set in the program and there will be no more of a challenge. An educational program of this type these days does need the facility to be able to enter a new set of words to be used. These could either be entered by the teacher or parent, or as a separate data file.

Iolo ap Gwynn



Mathematical

Program: Teach Me, AC Software, 434 Corn Exchange Building, Habnging Dutch, Manchester M4 3EY. **Price:** £5.45

THIS TAPE, aimed at junior school children aged seven to 11, deals with everyday mathematics — the four rules of numbers.

Children are asked to choose between addition, subtraction, multiplication and division, and hard and easy options exist within each set. They get three chances to do so. Any program purporting to "teach" should at least leave the user with some extra skill or knowledge. This does neither.

Translate this sort of program into the adult world. Imagine buying a program which says it will teach you Russian. It flashes a word on the screen and you have to translate it. If you get it wrong three times it gives the translation and then goes on to another word.

After a hundred or so times it might repeat itself but I doubt if you will remember that fleeting glance at the Russian and English equivalents — and

.nake the right answer and are told "too high" or "too low" after a mistake.

Each response is timed to one-hundredth of a second and this information is printed on the screen when the child answers the question correctly. After 10 questions they are graded from "You must try harder" onwards.

Now what trying harder has to do with hitting the right answer to a series of random questions, I don't know. Presumably if pupils knew how to take 211 from 509 they would do it. But one thing is for sure — if they couldn't when they started the test they could use "Teach Me" for 100 years and get no nearer to being able to

how long would it take for you to be able to converse with the "man in the street in Kiev" More than a life-time I suspect. Now for adults this would be laughed out of court but we put this sort of thing in front of children and expect them to learn from it.

The program is only livened up by some appalling spelling and grammatical errors:

What is 774 devide by 9?

or how about:

Go on have another five minute's.

How on earth software companies can put out this sort of thing is quite beyond me.

Mike Harrison



Graphical data

Program: Instant Graph Plotter, R & P International Computer Services, PO Box 129, Wembley, Middlesex HA0 2UG. **Price** £7.50

THE display of data in graphical form — and I use the term in its strictly mathematical, rather than computer, sense — is the most common form of presenting data visually. Instant Graph Plotter is a program that does just that, but it is much more than its title suggests.

Once the basic data is entered, guided by on-screen prompts, the graph is drawn on the hi-res screen, either on its own, or in conjunction with other graphs held by the com-

puter. Space doesn't permit mentioning the many control functions in full, but some of the main features are: addition, deletion or change of individual points, superimposition of grids, axis markers and lines and calculation of the area under the curve.

The graph can be instantaneously redrawn in logarithmic form, or with data converted to a power, root, reciprocal, or other multiplication factor.

If all this seems a little daunting, the package is amply supported by a 27-page manual, and half an hour spent with this, and using the excellent on-screen prompts, will make its use simplicity itself. Apart from its educational value, Instant Graph Plotter is useful in displaying graphic data, and would be handy for sales conferences, science fairs and exhibitions.

Written in Basic, it is readily accessible for modification, although as it stands, there is little memory left to spare on a 32K machine. Users with particular problems are invited to contact the suppliers, R & P International, for help.

Gordon Lee



Machine code

Program: Programmers Utilities, Microdeal, 41 Truro Road, St. Austell, Cornwall.
Price: £8.00

THIS cassette contains nine short programs that each make up a lesson about machine code programming in general and using the 6809E in particular. Some lessons are terminated with a short question and answer section sometimes using multi-choice answers.

The first session introduces the ideas behind machine code programming and how the different registers in the 6809E processor operate. The second session talks about different number systems and why hexadecimal and binary are used in computers rather than base 10. Many of the sessions use examples of machine code programming to illustrate particular points and to demonstrate the advantages over Basic.

Subsequent tutorials go through addressing modes, branching and the whole instruction set, and later sessions touch upon pseudo-ops and short machine-code routines used to speed up video displays in your own programs. The style is rather compact but friendly, and is not beyond the comprehension of an able secondary school pupil.

Although I feel there could have been more question and answer sessions, and that the computer is frequently used merely as an electronic blackboard, this cassette does go some way to demystifying the world of machine language and that can't in itself be a bad thing.

John Scriven



1. **DRAGON MONITOR — CLOAD "DRAGMON" and RUN**

This utility is a great aid when writing and debugging machine language programs. The commands are:

D — Display 8 bytes of memory
M — Modify memory
S — Save memory
L — Load memory
B — Set breakpoint
F — Fix breakpoint
E — Execute program
R — Display MC6809E Registers

Full instructions are included within this program.

2. **RAM TEST — CLOADM "RAMTEST" and EXEC**

This utility will test every bit of every byte of RAM in your system. If the RAM is OK, the message "RAM OK" will appear. If a bad byte is found, its address will be displayed.

3. **SCREEN DUMP — CLEAR 200,32384 (enter) CLOADM "SDUMP" and EXEC when required**

Use this utility to copy the text screen to the printer without having to change PRINT statements.

4. **TAPE DIRECTORY — CLOAD "TAPEDIR" and RUN**

Place a directory in front of your tapes for a quick reference. Full instructions are included within this program.

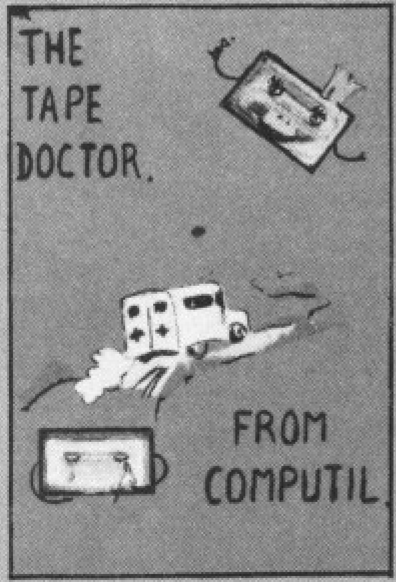
5. **TAPE ANALYSIS UTILITY — CLOAD "TAPEANLZ" and RUN**

Utilities



Program: Tape Doctor, Computil, 22 Grove Park, Burbage, Hinckley, Leicester LE10 2BJ.
Price: £4.99

THIS IS A utility program which has been written to enable the Dragon User to obtain more information about what has been recorded on tape by the Dragon and also to be able to salvage programs off tapes that have been damaged in some way.



How many times have you tried to load a program only to find that the header block has been corrupted in some way? Well this cassette contains the answer to your problems. It also enables the merging of different Basic programs, a facility which is sadly missing on the basic Dragon.

The copy which I received gave quite a few problems with loading. This is very unusual with the recorder I have and therefore I feel inclined to believe that the quality of the recording leaves something to be desired. However, by using the "Doctor" program I was able to find out where the program was stored in memory and was then able to CSAVEM a copy of it on to another cassette. Ever since I have done this I have had no trouble at all with the program.

The cassette, packed in an ordinary cassette box, comes with an 18-page manual on how-to-use the program. This is well written and if followed no difficulty should be experienced in learning how to use this facility. Some useful information is given on how the Dragon stores files on tape. Also on the tape is a Basic program which prepares shopping lists, supplied in ordinary form, ASCII form and in a couple of damaged versions so that program repair can be practised. Following these there are three short Basic programs for learning how to merge or append programs.

If you have a printer the "Doctor" also enables you to dump the contents of files (in blocks of hexadecimal numbers) on to paper as well as printing out catalogues of cassette contents, with useful details such as the length of a file and memory locations associated with Machine Code files. It also identifies whether files are Basic, ASCII, machine code or DATA types. This is formatted to fit on 89mm wide self-adhesive labels; just the job for sticking on to cassette boxes. This information can also be obtained without a printer of course.

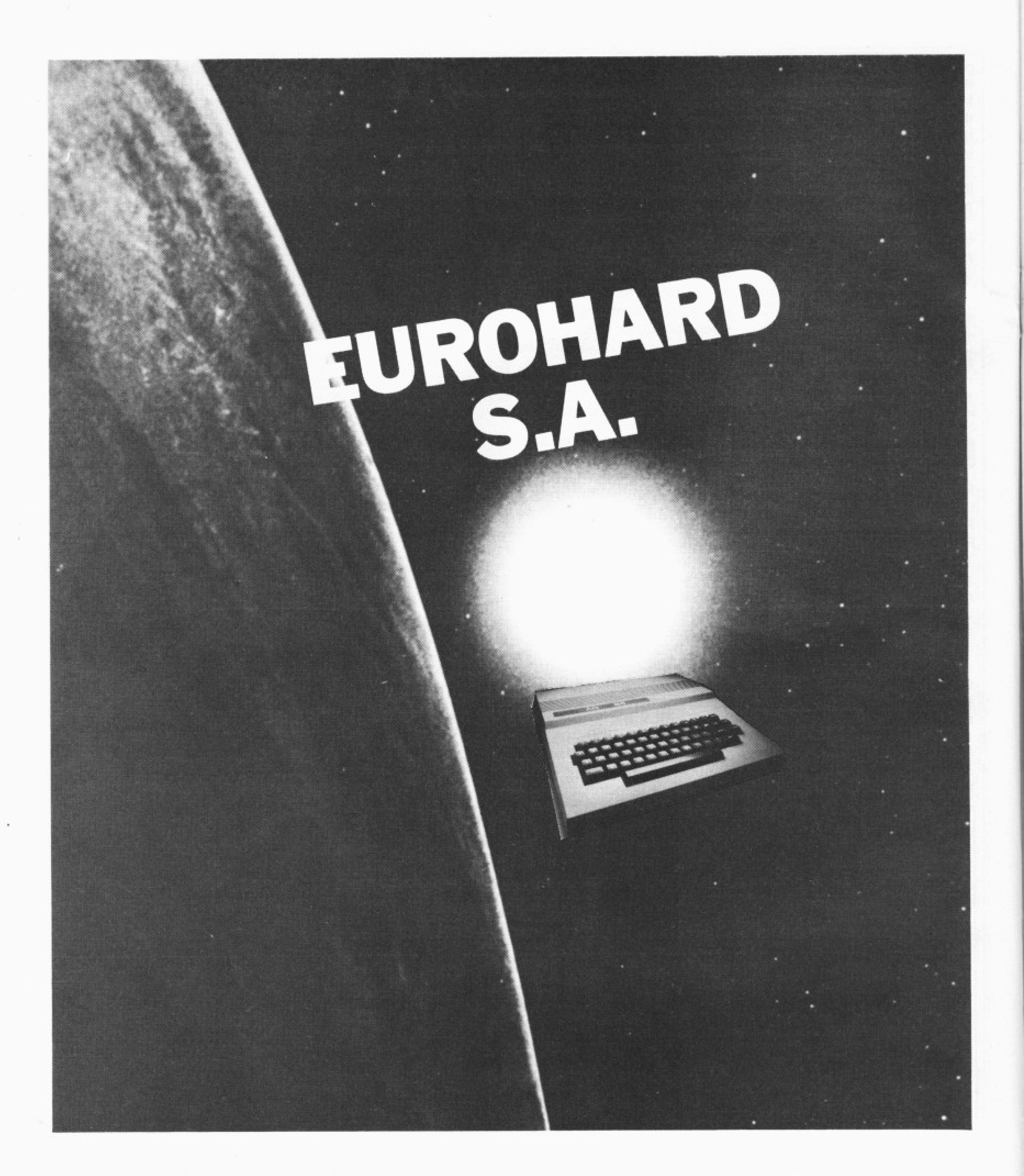
Once loaded normal Basic programs can be loaded into the computer and the "Doctor" called upon at any time simply by entering EXEC.

```
             +++ CATALOG +++
   NAME      TYPE    BLOCKS EXEC LOAD
DOCTOR     M/CODE    Ø7     753Ø 753Ø
SHOPPING   BASIC     ØE  OK
SHOPPING   BASICA    1Ø  OK
EXAMPLE    DATA      Ø1  OK
BAD CHECKSUM
DOCTOR     M/CODE    ØØ  HALT
DOCTOR     M/CODE    Ø1  HALT
```

All in all, this is a very good package and I give it a top rating for anyone who does a lot of programming, and could well need all its facilities. My only moan is that the manual is written in American and not in English.

Iolo ap Gwynn





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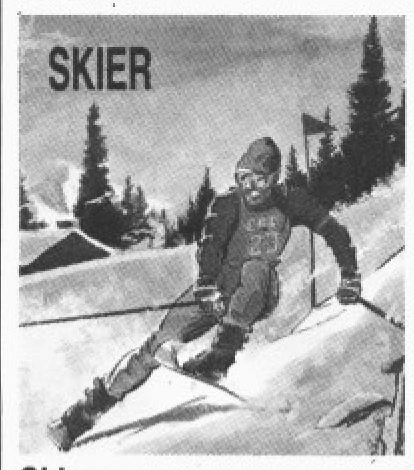
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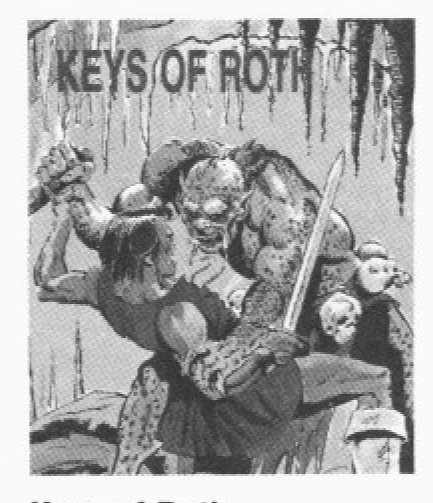
Froglet

A busy main road and a fast flowing river are the obstacles you must overcome in guiding the Froglet family back to the safety of their home. The better you get, the harder the task.



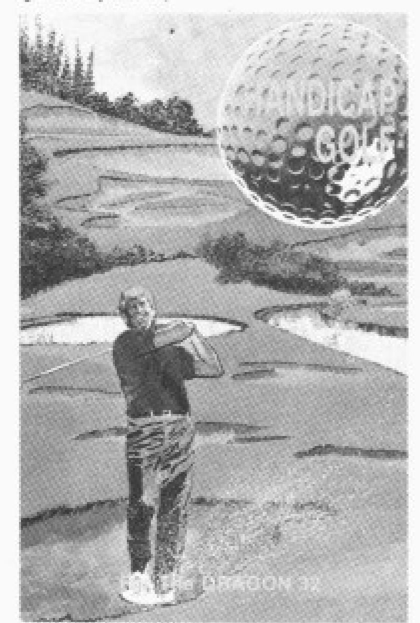
Skier

Try your hand at skiing down a giant slalom run, negotiating a series of slalom gates and avoiding the trees. The program is a 3D perspective simulation with five runs.



Keys of Roth

An adventurer in search of the keys, you must use your powers of deduction and determination to overcome the mysteries of the caverns. Orcs, trolls and the giant Jubjaroo are out to stop you in your quest.

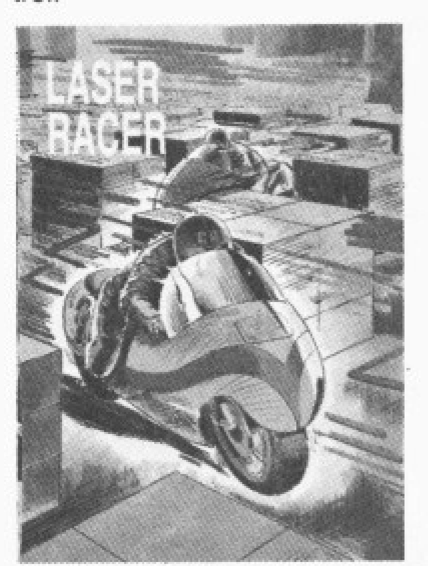


Handicap Golf

Bogeys, birdies, an albatross or par are all possible on this one- or two-player 18-hole handicap game. There are bunkers, lakes, trees, gorse bushes, the rough and gusting winds to be taken into account.

Laser Racer

Designed by Merlin software for Computer Rentals, Laser Racer puts you inside a huge computer. As the driver of a space-age laser racer, it is up to you to reach the computer's central processor and destroy it. Joystick or keyboard control.



St George and the Dragons

Slippery bridges and fire-breathing Dragons impede your progress as you attempt to steer the hapless saint across the screen to smite the magic stone and lift the curse from the castle and its maidens. Musical interludes accompany your failures. Joystick or keyboard control.

Dragon User Discount Club

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Blowing on an EPROM

***Keith and Steven Brain** review an EPROM programmer*

IN THE September 1984 issue of *Dragon User* we reviewed the impressive RS232 I/O port interface from Steve's Electronics Supply Company, and in this issue we return to take a look at a new EPROM programmer from the same source.

EPROMs differ from RAM in that they are non-volatile (retain their information when the power is removed), and a blank (empty) EPROM has all of its bits set to logical "1". A new EPROM is initially in this state, and a "used" EPROM can be returned to its original condition by suitable treatment with ultra-violet light in a special erasing unit. The actual programming ("blowing") of an EPROM involves selectively setting appropriate bits in the device to logic "0" to code for the required machine code routines, by applying a suitable voltage.

One-time device

The essential difference between a ROM and an EPROM is that the former is a "one-time" device whose contents can never be changed. In addition, preparing the "mask" for a ROM is a costly procedure, and they are therefore only really useful for long runs of unchanging routines. In fact a peek inside many home micros reveals that the "ROM" is really an EPROM.

At first sight the programming unit looks familiar as it uses essentially the same custom ABS cartridge as the RS232 and I/O port, with its supporting legs and secure connection to the Dragon cartridge slot. Notable differences, however, are a ZIF (zero insertion force) socket on the top to hold the EPROM safely and securely, and a pair of LEDs (green for power-on, and red for programming voltage indication) on the front.

Lifting the lid reveals a densely packed circuit board (once again bearing the logo of Race Electronics). The programmer tested was a "production" unit (priced at £78.00), but a kit version (£59.95) is also available for the electronics enthusiast, and the PCB (£11.95), control EPROM (£10.00) and case (£3.95) are also sold separately.

A fair degree of skill in wielding a soldering iron is essential in construction of the kit, and a number of the most useful features of the unit, including overload protection and Intelligent Programming are omitted from the specification of the kit version. Unless you are a really dedicated "do-it-yourself" enthusiast (or on the bread-line) then the ready-built version is the one recommended.

The power supply is taken directly from the Dragon bus, so that no external connections are needed, but at present the unit is only recommended for the Dragon 32 as the extra power consumption could possibly overload the harder-worked supply on the 64. A DC-DC converter switching at about 20 KHz is used to provide the various voltage levels required for different devices (which range from 3.5 to 25 V) and the resonance of the ferrite core produces a variable muted whistle as it works. Accompanying the unit is a comprehensive 11 page "user guide" which describes the operation in clear detail.

An important feature of this programming unit is its "user-friendly" face which uses a menu driven software structure (figure 1) to ensure that even the novice programmer can operate the unit without difficulties and constant recourse to the manual. On boot up the memory map is rearranged (figure 2) with a 16K block of RAM (termed the "map") set aside to provide an "image" of the EPROM contents. When an EPROM is programmed it always uses the curent "map" contents as the data source.

0 VERIFY
1 LOAD FROM EPROM
2 PROGRAM EPROM
3 EMPTY CHECK
4 EXAMINE/CHANGE
5 CLEAR DATA
6 COMPLEMENT/FILL DATA
7 LIST
8 SET ADDRESS LIMITS
9 LOAD FROM MEMORY
10 SET DEVICE TYPE
11 MOVE MEMORY BLOCK
12 QUIT

Figure 1: main menu functions

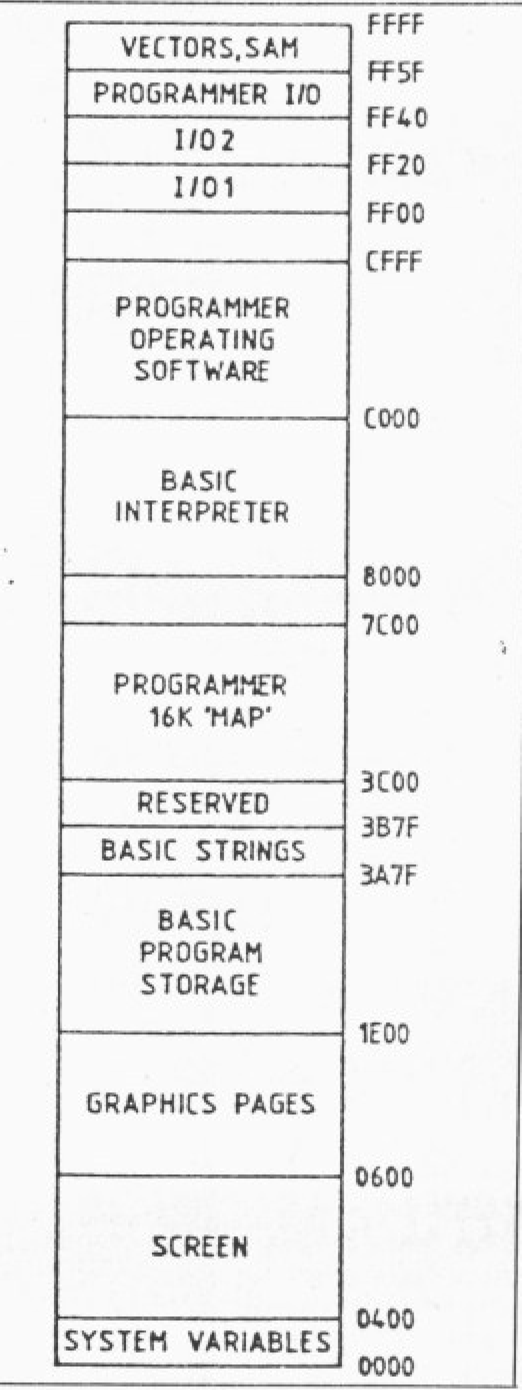


Figure 2: rearranged memory map

Automatic configuration

Up to 12 different types of single rail EPROM are supported (figure 3), with the unit being automatically configured for the current EPROM type by simple software selection via the keyboard, with the SET DEVICE TYPE option (rather than the usual system of having to set up a complicated series of DIP switches).

Intel 2708	Texas 2508
2716	2516
2732	2532
2732A	
*2764	
*2764A	
*27128	
*27128A	
*27256	*IPA option

Figure 3: EPROM types supported by ready-built unit

The 28 pin ZIF socket is used for both 24 pin and 28 pin devices, and the ready-built unit is effectively "bomb-proofed" against incorrect insertion of an EPROM. First of all the socket is normally in a "shut-down" condition, so that an EPROM cannot be inserted into an active socket, and secondly the unit automatically monitors the supply rails for error conditions, which cause automatic shut-down and display of appropriate error messages (figure 4) .

The designers have even considered the possibility of a hardware fault occurring, making it impossible to turn off the Vpp supply, when a screen prompt warns you not to insert any more valuable EPROMs. The only potential disaster remaining is incorrect selection of the standard 2764 or 27128 devices instead of the equivalent 2764A or 27128A chips (which use a lower programming voltage), so reading the small print on this particular type of chip before programming is essential.

The target EPROM type can be changed at any time so that it is possible to combine the contents of more than one

small EPROM onto a larger device and the massive 32K 27256 device is necessarily dealt with as two separate 16K halves. Lower and upper address limits can be specified, so that operations may be restricted to only certain parts of an EPROM.

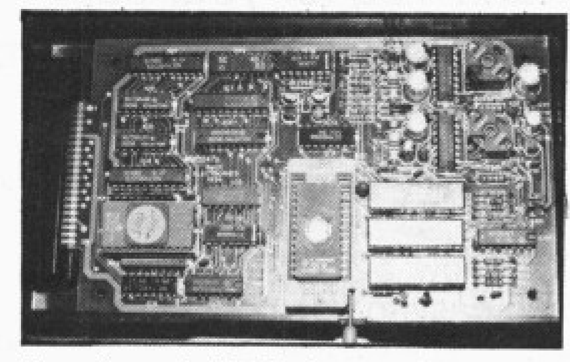
Continual checking

Intel's interactive Intelligent Programming Algorithm (IPA) is available on the larger devices. Although it *may* be necessary to apply a voltage for up to 50 milliseconds to change the state of a location, this time can often be reduced and IPA uses repeated one millisecond pulses. It drastically reduces the time taken to "blow" a device by continually checking whether the required data has already been "burnt-in" at the current location, moving on to the neat position as soon as it is successful.

LOAD FROM EPROM transfers an image of an EPROM inserted into the ZIF socket into the "map", and allows you to read (and hence copy) the contents of any EPROM, from any source. EMPTY CHECK examines each location in an EPROM to ensure that it is blank before use, whilst CLEAR DATA sets all bytes in the "map" area to the equivalent FF state.

EXAMINE/CHANGE provides direct access to the "map" data which is displayed as a hexadecimal dump, and LOAD FROM MEMORY transfers the contents of any block of Dragon memory to the "map" (so for example you could transfer the contents of the Dragon's Basic EPROM). Normal Basic commands are still accessible, so that loading, saving and modification of programs can be carried out easily.

QUIT takes you into Basic from where you can return to the programmer with EXEC &HC002 for a "cold" start, or EXEC &HC009 for a "warm" start where the "map" data is preserved. COMPLEMENT/FILL DATA provides inversion (1's complement) of "map" data or fills with any user-selected byte. MOVE MEMORY BLOCK allows rearrangement within the



"map", and LIST dumps the current "map" contents to screen or printer.

The SET ADDRESS LIMITS function provides selectivity by allowing the action of these commands to be restricted to defined address ranges. VERIFY provides comparison of "map" data and EPROM contents, returning "PASSED" or "FAILED" appropriately, together with errant locations and EPROM data. Useful screen prompts are provided to guide you through each of the functions.

```
OVERLOAD ON ZIF SOCKET
CHECK EPROM CORRECTLY
INSERTED
```

Figure 4: Example error message

A look at the prices and facilities of small dedicated EPROM programmers shows that this Dragon/programmer combination is a cost-effective solution for users who need to blow relatively small numbers of EPROMs for development or small-scale commercial applications.

Of course the unit allows you to "examine" EPROMs developed for any machine and although ready availability of an easy-to-use EPROM copier may send shudders through the hearts of cartridge manufacturers, there are home applications which do not raise such moral difficulties. For example, utility programs transferred to EPROM are instantly accessible and do not eat into available RAM.

High standard

All in all this EPROM programmer is well designed and constructed, very user friendly, and well up to the high standard set by the earlier Dragon add on from Steve's Electronics.

(For a photocopy of the RS232 I/O port interface review published in the September issue send a large, stamped addressed envelope to *Dragon User*.)

Steve's Electronics is currently working on a card supporting software-selectable sideways ROMs which will allow you to have a whole suite of "firmware" instantly available. For further details contact Steve's Electronics Supply Company, 35 Castle Arcade, Cardiff CF1 2BW, telephone: (0222) 41905.■

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Hecho en España

made in Britain

Gordon Ross talks to Eduardo Merigo, President of Eurohard SA

A REVAMPED version of the Dragon 64, together with a whole range of peripherals and add-ons, will be available in shops throughout Britain early this year. It will be distributed by Compusense through several small distributors and retail outlets, providing a nation-wide network of retail and after sales services.

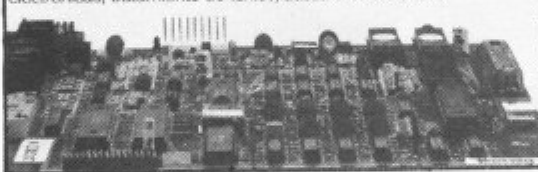
This news was divulged by Eduardo Merigo, president of Eurohard SA, the Spanish manufacturers of the Dragon at the 6809 show held at the Royal Horticultural Halls in London.

Eurohard SA has begun production of the Dragon 32 and 64 at its plant at Caceres in Spain, and by Christmas hopes to have sold 25,000 units — its advance sales order.

CON TODO EL FÚTURO DENTRO

Para que no se quede fuera de su ordenador ni un ápice de futuro, el Dragón 64 recoge los adelantos mas revolucionarios en el terreno de la informática.

Como el exclusivo sistema operativo OS9 creado por Dragón, que puede añadirse al sistema estándar Microsoft, lo que facilita el acceso a una gama muy amplia de software profesional. (Hojas electrónicas, tratamiento de textos, bases de datos, etc.).



An excerpt from Eurohard's brochure

Early "teething" problems meant that the company did not start manufacturing the Dragon until November, a month later than planned. To meet the initial demand for its products Eurohard purchased the remainder of GEC's stocks of the Dragon — 13,000 32's, 64's and disk drives, all at marked down prices.

The Dragon 32 retails for approximately £200 in Spain, and the 64 at £300. At present Eurohard is producing 500 units a day at its manufacturing plant. By early next year it hopes to be the number one selling micro in Spain, and at the very worst, said Eduardo, number two.

Eduardo's association with computers is relatively new. He graduated in economics from the University of Geneva and went on to study postgraduate work at a university in Montana in the USA. He has spent most of his working life overseas — 12 years at the Organisation for Economic Co-operation and Development in Paris followed by a few years at a similar organisation in Geneva.

Subsequently, he became a member of the board of Visa International and started his own computer firm, Chip Electronics, which imported peripherals into Spain for the IBM PC and compatible micros.

His venture into the micro-computer world was out of "intellectual curiosity at first", followed by the realisation that "there was good scope to do a good job".

The initiative to actually start manufacturing Dragons in Spain came from a number of people working for ICS — the Spanish importer of the Dragon.

Eurohard SA was formed in May 1984 with the intention of obtaining a licence to produce Dragons in Spain. An agreement was reached with Dragon Data and was signed just before Dragon Data went into liquidation. The company obtained the sole rights to manufacture Dragons in Spain (for sale in Spain and the Spanish speaking world) at a cost of £7 per micro.

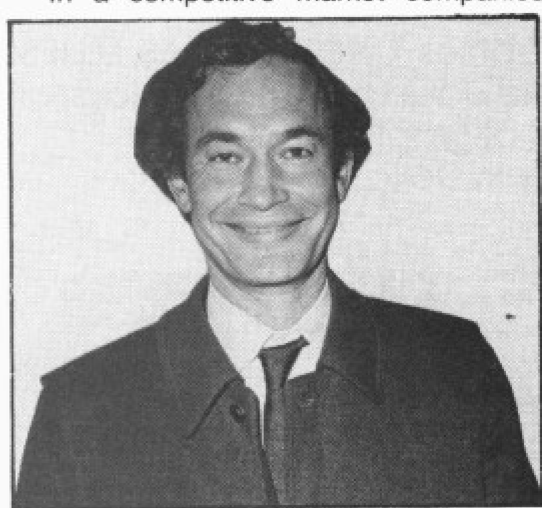
Having accomplished what they set out to do, Eurohard was then treated to the news that Dragon Data had gone into liquidation and that their agreement meant nothing. The first few meetings with the receiver were difficult. However, eventually Eurohard obtained Dragon Data's assets, including its intellectual property rights and the Microsoft licence for £1 million.

Enhanced models

Eduardo said that the demise of Dragon Data made Eurohard's life "more difficult, yet more exciting". Not being able to rely on Dragon Data meant that Eurohard had to go it alone.

Eduardo is very much aware of Dragon Data's mistakes. He said the biggest mistake a company could make was with regard to market forecasts. "Poor management meant that there were not enough components at Dragon Data when there was a large demand for their product, but when demand fell there were too many components in stock.

"In a competitive market companies cannot afford to make this mistake."



Eduardo Merigo of Eurohard

Eduardo also found fault with Dragon Data's distribution plans. He believes that large retail stores are the wrong distribution channels as there is no after sales service and little technical information available. Hence the desire to distribute Dragons in the UK through Compusense. "I was impressed by their level of competence," said Eduardo, "we definitely want distributors of the Compusense type."



Eurohard's plan is to launch enhanced models of the Dragon 32 and 64 in March. The new models will be called the Dragon 100 and 200 respectively. The 100 will not be available in the UK.

The enhanced version of the 64 will have improved graphics capabilities with perhaps a Vivaway multiple interface board. At present negotiations are under way with Motorola. In Spain the enhanced versions will also have Spanish characters. All Dragons will also have the four arrow keys grouped together rather than on either side of the keyboard as at present.

Dragon 32 upgrades will also be on sale. A conversion kit already exists and is available mail order in Spain, and Eurohard is soon to begin board manufacturing. Old 32 boards will then be able to be exchanged for 64 boards.

A range of peripherals are also on the way. Eurohard is to offer a Dragon compatible 4 colour printer plotter, 40 and 100 characters per second printers, a new slim line disk drive using 5¼ inch disks, and a sequential 2.8 inch floppy drive. The ▶



◀ latter, it is hoped, will do away with the need to use cassette recorders. It will cost about a third of the price of a drive and will take at most eight seconds to load.

Its success depends on Eurohard's ability to reach agreement with software companies to sell software on the drives.

On top of all this, Eurohard also expects to begin production of an MSX machine by the middle of this year. The machine will not be Dragon compatible, and will be sold as a separate line to Eurohard's Dragon products. In Britain it will be distributed by GEC.

Games machine

Eduardo confirmed that Eurohard obtained the Microsoft licence for $250,000. He sees the MSX micro as a games machine: "MSX is designed for a given market. I do not see it as upwards compatible. It will be produced largely for export and kept for entertainment."

In contrast, Eduardo sees the role of the Dragon as primarily an educational and small business machine. An intensive advertising campaign has begun on Spanish television and, by the middle of next year, a television programme will start, with Eurohard taking a similar role to that undertaken by Acorn for the BBC.

The Dragon has already been bought by one regional educational authority in Spain, and in some schools there exists a small networking system. A master Dragon is used by teachers, with pupils networking on other, smaller Dragons.

Eurohard is keen to encourage and utilise other people's ideas. "It is important to use the creative efforts of other people," said Eduardo. Software writers can contact the company with potential programs for appraisal.

At present most software for the Dragon in Spain has been converted from British titles, but recently Spanish software companies have been getting into the act.

For the small business user, Eurohard intends to use OS-9 as the standard operating system. "Flex," said Eduardo, "is a very British product and is not found elsewhere." OS-9 on the other hand is "fairly widespread and through it we hope to introduce people to UNIX".



Five hundred units a day are being produced

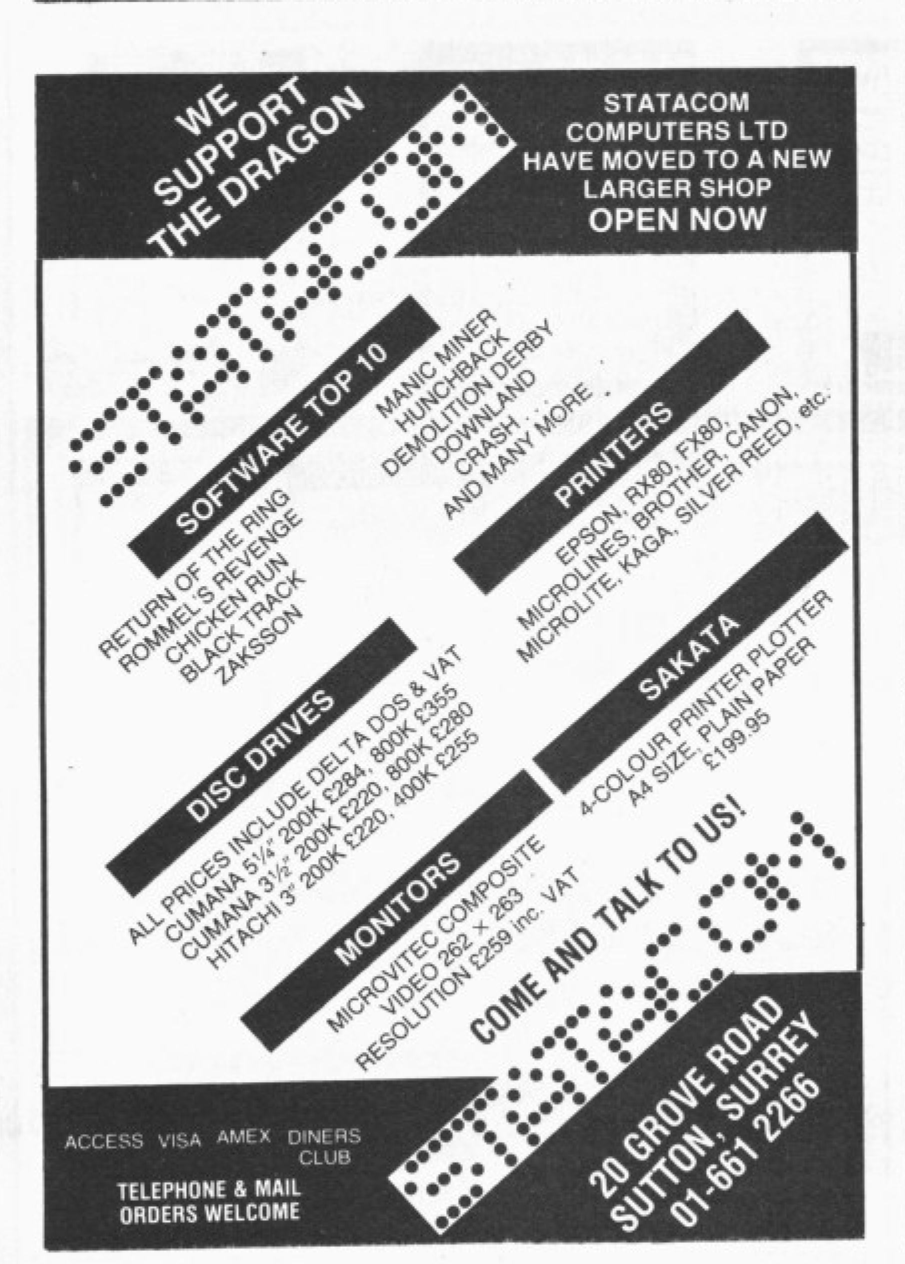
Complete system

A complete package, called the Dragon 300, may also be offered to the small business user. This would incorporate a disk drive, operating system and micro — similar to what Compusense is offering users at present, rather than a product along the lines of the ill-fated Dragon Professional.

A six-month warranty is being offered to purchasers of the Dragon in Spain and Europe. At present, Dragons are being sold in Spain, France, Italy, Greece, Israel and the Scandinavian countries. Once Spain joins the EEC, Eurohard will have an even bigger potential market, and it also intends to take on the Latin American market.

When Eurohard begins operation of its board manufacturing plant, it will also produce add-on boards for the IBM PC and MSX. An agreement has already been reached with two US manufacturers to produce boards for the European market.

Beginning this month, Eurohard intends to start advertising in the UK. "We can't abandon a user base of that size," said Eduardo. "The new peripherals, in particular the sequential drive, should be of interest to British owners of the Dragon." ■



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Tim Love's CRICKET
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"Superb — Many other computer owners will wish they had bought a Dragon" — IG
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Cartoon character animation in full colour and 100% machine code.

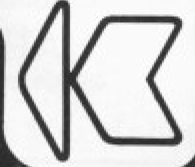
Race and chase through the revolving doors, avoiding the Troglabytes and searching for the keys to open the central chamber.



HAVE A MERRY CHRISTMAS WITH CABLE

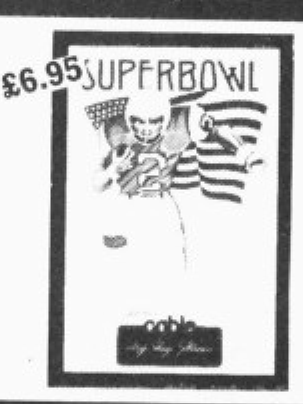
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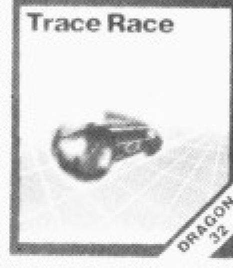






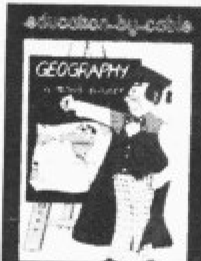


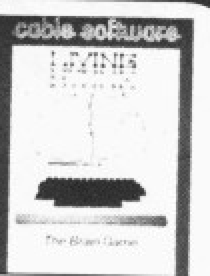












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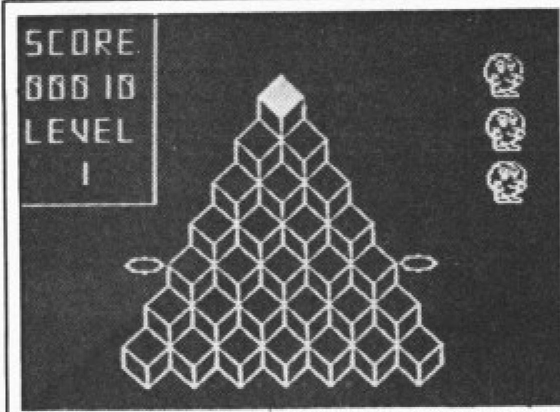
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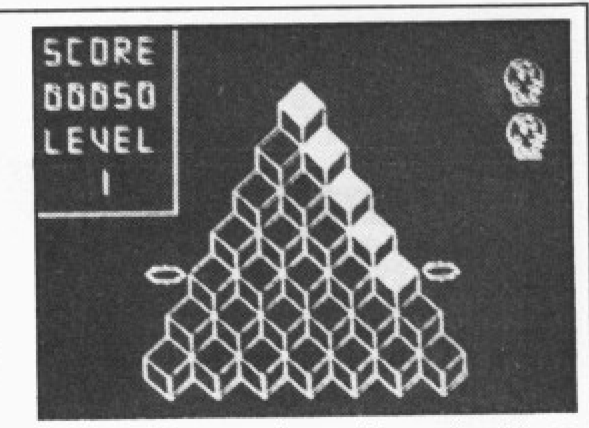
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King of the hill

Watch out for Splurge the homicidal cabbage in Q'bert by

P Thompson



THIS program is based upon the popular arcade game where you control a cute long-nosed character while he hops all over a three-dimensional pyramid.

Little Bert must travel the astral pyramid turning all the top layers of the cubes making the pyramid white. He does this by landing on them, and jumps from cube to cube diagonally. If he paints all the pyramid, he is transported to a new pyramid.

Bert's task is not easy. Coilly Cobra and Splodge the homicidal cabbage do their best to bring an end to Q*Bert by pushing him off the pyramid. Coilly can chase Q*Bert all over the pyramid. The higher the level the faster he travels. Splodge usually appears at the top of the pyramid and rolls down flattening all in his path, but is known for his slyness and will often teleport to a cube near Bert in order to flatten him.

As a last resort, the two floating discs at the side of the pyramid can be used to transport Bert to the top cube of the pyramid. However, this has its problems as Splodge has a habit of ripping intruders on the top cube to shreds.

The game is quite fast for Basic, and you load it by typing "CLOAD" and pressing the all powerful Enter key. Be very careful in entering the data in lines 56-125. If you make one mistake you could ruin all the graphics.

Copies of the game can be obtained for £3 plus a SAE from: P Thompson, 54 Pentyla, Port Talbot, West Glamorgan. The game works on both the 32 and 64.

Program notes

0-30	Display game instructions and title page.
32-45	Set number strings for hi-res display.
47-126	Draw the score box and draw graphic boxes for Q*Bert, Splodge and Coilly.
129-148	Draw pyramid.
155-225	Main program loop.
170-194	Move Q*Bert and check to see if he has fallen off the pyramid.
195-207	Move Coilly.
207-220	Check to see if Coilly has landed on you or if Splodge has hit you.
220-225	Check to see if whole pyramid is filled.
230-251	Interval screens and final screen.
251-265	Display score and high score.
274-end	Pyramid check routine (accessed from line 223) and extra intervals for a rest between screens.

```
0 R=RND(TIMER)
1 CLS
2 PRINT
3 PRINT"  @@       @@   @@@@ @@@  @@@@@"
4 PRINT" @  @      @ @  @    @  @   @"
5 PRINT" @  @   @  @@@@ @@@  @@@    @"
6 PRINT" @@ @  @ @ @  @ @    @@     @"
7 PRINT" @ @@   @  @ @  @    @ @    @"
8 PRINT"  @@@      @@   @@@@ @  @   @"
9 FORT=1024 TO 1024+288
10 IF PEEK(T)<>96 THEN POKE(T),137+RND(7)*16
11 NEXTT
12 PRINT@448," PRESS ANY KEY TO CONTINUE GAME";:PRINT@288," WRITTEN BY PHILIP TH
OMPSON 1984"
13 IF INKEY$="" THEN GOTO 9
14 PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT
:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT
15 POKE359,19:POKE360,19:POKE361,19
16 PRINT" WELCOME TO THE GAME OF Q*BERT.  IT'S A VERY EASY GAME TO PLAY,  ALL YO
U HAVE TO DO IS TO PAINT  ALL THE CUBES WHITE BY JUMPING  ON TOP OF THEM. EASY?
WELL IT   WOULD BE BUT....."
17 PRINT
18 PRINT" PATROLLING THE PYRAMID ARE TWO  VERY NASTY PEOPLE. THEY ARE     (1) CO
ILLY. "
19 PRINT" THIS IS A LARGE COBRA THAT WILL CHASE Q*BERT ALL OVER THE       SCREEN
. IF HE CATCHES Q*BERT     THEN Q*BERT'S HAD HIS CHIPS!"
20 PRINT" (2) SPLODGE."
21 PRINT" THIS IS A HOMOCIDAL CABBAGE     THAT WILL DO G.B.H. TO ALL IN    HIS PA
TH. "
22 PRINT" CONTROL Q*BERT WITH THE RIGHT   JOYSTICK AND PRESS THE FIRE     BUTTON
 WHEN YOU HAVE PAINTED IN ALL THE CUBES. "
23 PRINT" THE GAME HAS 10 LEVELS AND YOU  GO UP ONE EVERY TIME YOU        COMPLE
TE A PYRAMID. "
24 PRINT" ON LEVELS 1-4 TWO DISCS HOVER   AT THE SIDE OF THE PYRAMID. IF  Q*BERT
 JUMPS ON THESE FROM       BELOW THEY WILL TRANSPORT HIM   TO THE TOP CUBE."
25 PRINT" THATS ALL THE INSTRUCTIONS.     GET READY TO PLAY 'Q*BERT'!"
26 PRINT
27 PRINT" PRESS ANY KEY TO CONTINUE GAME"
28 H$=INKEY$
29 PLAY"T255O5CDE"
30 IF H$="" THEN 28
31 POKE359,0:POKE360,0:POKE361,0
32 CLS
33 PCLEAR8
34 DIMN$(10)
35 N$(1)="BM+5,+0;C5D10"
36 N$(2)="C5R5D5L5D5R5"
37 N$(3)="C5R5D5L5R5D5L5"
38 N$(4)="D5R5U5D10"
39 N$(5)="R5L5D5R5D5L5"
40 N$(6)="D10R5U5L5"
41 N$(7)="R5G5D5"
42 N$(8)="R5D5L5U5D5D5R5U5"
```



Continued on page 25

```
43 N$(9)="C5R5D5L5U5R5D5D5"
44 N$(0)="R5D10L5U10F5"
45 A=0:B=0:C=0:D=0:E=0
46 PMODE4,1:PCLS:CLS0:PRINT@35,"initialising";
47 DRAW"BM10,20;C5;R5U5L5U5R5BM+5,+0;C5;R5L5D10R5BM+5,+0;C5U10R5D10L5R5BM+5,+0;C
5U10R5D5L5F5BM+5,+0;C5R5L5U5R5L5U5R5"
48 DRAW"BM10,50;C5;D10R5BM+5,+0;C5;R5L5U5R5L5U5R5BM+5,+0;D5F5U10BM+5,+0;R5L5D5R5
L5D5R5BM+5,+0;U10D10R5"
49 LE=0
50 LINE(0,0)-(65,90),PSET,B
51 NM=3
52 PMODE4,5:PCLS
53 FORY=1 TO 20:FORX=1 TO 20
54 READA:IFA=1 THEN PSET(X+100,Y+100,5):SET(X+12,Y+6,5)
55 NEXTX:NEXTY
56 DATA 0,0,0,0,0,0,1,1,1,1,1,1,1,1,0,0,0,0,0,0
57 DATA 0,0,0,0,1,1,0,0,0,0,1,1,0,0,1,0,0,0,0,0
58 DATA 0,0,0,1,0,1,1,0,0,0,0,0,1,0,0,1,0,0,0,0
59 DATA 0,0,0,1,0,0,0,1,1,1,0,1,0,1,0,0,1,0,0,0
60 DATA 0,0,1,0,0,0,1,0,0,1,0,1,0,0,1,0,0,1,0,0
61 DATA 0,0,1,0,0,0,1,0,1,1,0,1,1,1,1,0,0,1,0,0
62 DATA 0,1,0,0,0,0,0,1,0,1,0,1,0,1,0,0,0,1,0,0
63 DATA 0,1,0,0,0,0,0,1,1,1,0,0,1,1,0,0,0,1,0,0
64 DATA 0,1,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,1,0,0
65 DATA 0,1,0,0,1,0,1,0,0,0,0,0,0,1,1,1,0,1,0,0
66 DATA 0,1,0,0,1,0,1,0,0,0,0,0,0,0,0,1,1,1,0,0
67 DATA 0,0,1,0,1,0,1,0,0,0,1,0,0,0,1,0,0,1,0,0
68 DATA 0,0,1,0,1,0,0,1,0,0,0,1,1,1,1,0,0,1,0,0
69 DATA 0,0,0,1,0,1,1,1,0,0,0,0,0,0,1,1,1,0,0,0
70 DATA 0,0,0,0,1,0,1,0,0,0,0,0,0,0,1,1,0,0,0,0
71 DATA 0,0,0,0,1,0,0,1,0,0,0,0,1,1,0,0,0,0,0,0
72 DATA 0,0,0,0,1,0,0,1,1,1,1,1,1,0,0,0,0,0,0,0
73 DATA 0,0,0,0,1,0,1,1,1,1,0,0,1,1,1,0,0,0,0,0
74 DATA 0,0,0,0,1,0,0,0,0,0,1,0,0,0,0,1,0,0,0,0
75 DATA 0,0,0,0,0,1,1,1,1,1,1,1,1,1,1,1,0,0,0,0
76 DIMQB(20,20):GET(100,100)-(120,120),QB,G:PCLS
77 FORY=1 TO 20:FORX=1 TO 20
78 READA:IF A=1 THEN PSET(X+100,Y+100,5):SET(X+35,Y+6,4)
79 NEXTX:NEXTY
80 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
81 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
82 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
83 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
84 DATA 0,0,0,0,0,0,0,0,1,1,1,1,0,0,0,0,0,0,0,0
85 DATA 0,0,0,0,0,0,1,1,0,0,0,0,1,1,0,0,0,0,0,0
86 DATA 0,1,1,0,0,1,1,0,1,0,0,1,0,1,1,1,0,0,1,1
87 DATA 0,1,0,1,1,0,0,0,0,0,0,0,0,0,0,1,1,0,1
88 DATA 0,0,0,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,0,0
89 DATA 0,0,0,1,1,1,1,1,1,1,0,1,1,1,1,1,1,1,0,0
90 DATA 0,0,1,0,1,0,0,1,1,1,0,1,1,1,0,0,1,0,1,0
91 DATA 0,0,1,0,1,1,1,1,1,0,0,0,1,1,1,1,1,0,1,0
92 DATA 0,0,1,0,0,1,1,1,0,0,0,0,0,1,1,1,0,1,0,0
93 DATA 0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0
94 DATA 0,0,0,1,0,0,0,0,0,1,1,1,0,0,0,0,0,1,0,0
95 DATA 0,0,0,1,0,0,0,1,1,0,0,0,1,1,0,0,1,0,0,0
96 DATA 0,0,0,0,1,0,0,1,0,0,0,0,0,1,0,0,1,0,0,0
97 DATA 0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,1,0,0,0,0
98 DATA 0,0,0,0,0,0,1,1,0,0,0,0,0,1,1,0,0,0,0,0
99 DATA 0,0,0,0,0,0,0,0,1,1,1,1,1,0,0,0,0,0,0,0
100 DIMBA(20,20):GET(100,100)-(120,120),BA,G:PCLS
101 FORY=1 TO 20:FORX=1 TO 20
102 READA:IFA=1 THEN PSET(X+100,Y+100,5)
103 NEXTX:NEXTY:SC=0:NM=3:LE=1
104 A=0:B=0:C=0:D=0:E=0
105 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
106 DATA 0,0,0,0,0,0,0,1,1,1,1,1,1,0,1,0,0,0,0,0
107 DATA 0,0,0,0,0,0,1,0,0,0,1,1,0,1,1,1,1,1,0,0
108 DATA 0,0,0,0,0,1,0,0,0,1,1,0,0,0,1,0,0,1,0,0
109 DATA 0,0,0,0,1,0,0,1,1,0,0,1,1,0,1,0,0,1,0,0
110 DATA 0,0,0,0,1,0,1,1,1,1,1,1,1,1,1,1,1,0,1,0
111 DATA 0,0,0,0,1,0,1,1,1,1,0,0,1,0,1,0,0,1,0,0
112 DATA 0,0,0,0,1,1,0,1,1,1,1,1,1,0,!,1,1,1,0,0
113 DATA 0,0,0,1,0,1,1,0,0,0,0,0,1,0,1,0,0,1,0,0
114 DATA 0,0,0,1,0,1,0,1,1,1,1,1,0,0,1,0,0,0,0,0
115 DATA 0,0,0,1,1,0,0,0,0,1,1,1,1,1,0,0,0,0,0,0
116 DATA 0,0,0,1,0,1,0,0,1,0,1,1,1,1,0,0,0,0,0,0
117 DATA 0,0,0,0,1,0,1,1,1,1,1,1,0,1,0,0,0,0,0,0
118 DATA 0,0,0,0,1,1,0,0,0,0,1,1,0,0,0,0,0,0,0,0
119 DATA 0,0,0,0,0,0,1,1,1,1,1,0,0,0,0,0,0,0,0,0
120 DATA 0,0,0,0,0,0,0,1,0,1,0,0,0,0,0,0,0,0,0,0
121 DATA 0,0,0,0,1,0,0,0,1,0,1,0,0,0,0,0,0,0,0,0
122 DATA 0,0,0,0,0,1,0,0,1,0,1,0,0,0,0,0,0,0,0,0
123 DATA 0,0,0,0,0,0,1,1,1,1,0,0,0,0,0,0,0,0,0,0
124 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
125 DIMCO(20,20):GET(100,100)-(120,120),CO,G
126 PCLS
127 PY$="E10F10G10H10D10F10U10D10E10U10"
128 PMODE4,1
129 ' DRAW PYRAMID
130 DRAW"BM110,40;"+PY$
131 C1=1:C2=1:DRAW"BM70,120;"+PY$+PY$
132 DRAW"BM100,60;"+PY$+PY$
133 DRAW"BM90,80;"+PY$+PY$
134 DRAW"BM130,80"+PY$
```







Continued on page 27

```
135 DRAW"BM80,100;"+PY$+PY$
136 DRAW"BM120,100;"+PY$+PY$
137 DRAW"BM110,120;"+PY$+PY$
138 DRAW"BM150,120;"+PY$
139 DRAW"BM60,140;"+PY$+PY$
140 DRAW"BM100,140;"+PY$+PY$
141 DRAW"BM140,140;"+PY$+PY$
142 DRAW"BM50,160;"+PY$+PY$
143 DRAW"BM90,160;"+PY$+PY$
144 DRAW"BM130,160;"+PY$+PY$
145 DRAW"BM170,160;"+PY$
146 CIRCLE(60,120),8,5,0.5:CIRCLE(180,120),8,5,0.5
147 SC=0:NM=3:C1=1:C2=1:DRAW"BM70,120;"+PY$+PY$
148 '
149 VC=1:CX=50:CY=140
150 QX=110:QY=20
151 VB=0:BX=110:BY=20
152 SCREEN1,1:IFLE>=5 THEN C1=0:C2=0
153 GOSUB226
154 PLAY"T10001CDEFGABO2CDEFGABO3CDEFGABO4CDEFGABABA
    BABAO5CDEAFGBBBGFDECADEDCD"
155 PMODE4,1:SCREEN1,1:LINE(10,30)-(55,40),PRESET,BF
156 DRAW"BM10,30"+N$(A)
157 DRAW"BM20,30"+N$(B)
158 DRAW"BM30,30"+N$(C)
159 DRAW"BM40,30"+N$(D)
160 DRAW"BM50,30"+N$(E)
161 DRAW"BM30,70"+N$(LE):IF PPOINT(QX+10,QY+20)=0
    THEN D=D+1:IF D=10 THEN D=0:C= C+1:IF C=10 THEN
    C=0:B=B+1:IF B=10 THEN B=0:A=A+1:IF A=10 THEN A=0
162 PAINT(QX+10,QY+20),5,5
163 PCOPY1 TO 5:PCOPY2 TO 6:PCOPY 3 TO 7:PCOPY 4 TO 8
164 PUT(QX,QY)-(QX+20,QY+20),QB,PSET
165 IF VC=1 THEN PUT(CX,CY)-(CX+20,CY+20),CO,PSET
166 IF VB=1 THEN PUT(BX,BY)-(BX+20,BY+20),BA,PSET
167 ''''''''''''''''''''''
168 '    MOVE Q*BERT
169 ''''''''''''''''''''''
170 JX=JOYSTK(0):JY=JOYSTK(1)
171 IF JX<20 AND JY<20 THEN QX=QX-10:QY=QY-20
172 IF JX<20 AND JY>40 THEN QX=QX-10:QY=QY+20
173 IF JX>40 AND JY<20 THEN QX=QX+10:QY=QY-20
174 IF JX>40 AND JY>40 THEN QX=QX+10:QY=QY+20
175 ON QY/20 GOTO 176,178,180,182,184,188,190,230,230,230
176 IF QX<>110 THEN 230
177 GOTO 194
178 IF QX<100 OR QX>120 THEN 230
179 GOTO 194
180 IF QX<90 OR QX>130 THEN 230
181 GOTO 194
182 IF QX<80 OR QX>140 THEN 230
183 GOTO 194
184 IF QX>=70 AND QX<=150 THEN 194
185 IF QX=50 AND C1=1 THEN C1=0:GOSUB192::CIRCLE(60,120),8,0,0.5:GOSUB193:QX=110
:QY=20:PLAY"T22501CDEFGO2CDEFGO3CDEFGO4CDEFGO5CDEFG":GOTO 194
186 IF QX=170 AND C2=1 THEN C2=0:GOSUB192:CIRCLE(180,120),8,0,0.5:GOSUB193::QX=1
10:QY=20:PLAY"T22501CDEFGO2CDEFGO3CDEFGO4CDEFGO5CDEFG":GOTO 194
187 GOTO 230
188 IF QX<60 OR QX>160 THEN 230
189 GOTO 194
190 IF QX<50 OR QX>170 THEN 230
191 GOTO 194
192 PCOPY5 TO 1:PCOPY6 TO 2:PCOPY7 TO 3:PCOPY8 TO 4:RETURN
193 PCOPY 1 TO 5:PCOPY2 TO 6:PCOPY3 TO 7:PCOPY 4 TO 8:RETURN
194 IF C1=1 THEN CIRCLE(60,120),8,0,0.5
195 H=RND(LE+1):IF C2=1 THEN CIRCLE(180,120),8,0,0.5
196 IF H=1 THEN GOTO 207
197 IF VC=0 THEN GOTO 207
198 CC=CX:DD=CY:PLAY"T25505C"
199 IF QY>CY AND QX>CX THEN CX=CX+10:CY=CY+20
200 IF QY<CY AND QX<CX THEN CX=CX-10:CY=CY-20
201 IF QY>CY AND QX<CX THEN CX=CX-10:CY=CY+20
202 IF QY<CY AND QX>CX THEN CX=CX+10:CY=CY-20
203 IF CC=CX AND DD=CY AND QX>CX THEN CY=CY-20:CX=CX+10
204 IF CC=CX AND DD=CY AND QX<CX THEN CY=CY-20:CX=CX-10
205 IF CC=CX AND DD=CY AND QY<CY THEN CY=CY-20:CX=CX-10
206 IF CC=CX AND DD=CY AND QY>CY THEN CY=CY+20:CX=CX+10
207 '
208 '     CHECK FOR COILLY
209 IF CX=QX AND CY=QY AND VC=1 THEN GOTO 230
210 ' START BALL
211 IF RND(100)<LE*10 AND VB=0 THEN VB=1:GOTO 214
212 IF VB=0 THEN 220
213 IF RND(100)>90 AND VB=0 THEN VB=1
214  IF BX=QX AND BY=QY AND VB=1 THEN GOTO 230
215 R=RND(2)
216 IF R=1 THEN BX=BX-10 ELSE BX=BX+10
217 BY=BY+20
218 PLAY"T22501C"
219 IF BY>=170 THEN VB=0:BX=110:BY=20
220 '
221 ' CHECK FOR COMPLETE PYRAMID
222 P=PEEK(65280)
223 GOSUB273 '126 254
224 PCOPY5 TO 1:PCOPY6 TO 2:PCOPY7 TO 3:PCOPY8 TO 4
```

Continued on page 29

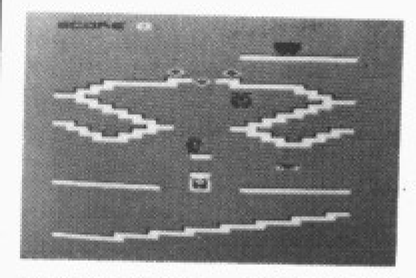
```
225 GOTO 155
226 IF NM>=1 THEN PUT(210,20)-(230,40),QB,PSET ELSE LINE(210,20)-(230,40),PRESET
,BF
227 IF NM>=2 THEN PUT(210,45)-(230,65),QB,PSET ELSE LINE(210,45)-(230,65),PRESET
,BF
228 IF NM>=3 THEN PUT(210,70)-(230,90),QB,PSET ELSE LINE(210,70)-(230,90),PRESET
,BF
229 RETURN
230 PCOPY5 TO 1:PCOPY6 TO 2:PCOPY7 TO 3:PCOPY8 TO 4
231 FORT=1 TO 20
232 SOUNDRND(255),1
233 PUT(QX,QY)-(QX+20,QY+20),QB,PRESET
234 PUT(QX,QY)-(QX+20,QY+20),QB,PSET
235 NEXTT
236 PCOPY5 TO 1:PCOPY6 TO 2:PCOPY7 TO 3:PCOPY8 TO 4
237 NM=NM-1:GOSUB226
238 PCOPY1 TO 5:PCOPY2 TO 6:PCOPY3 TO 7:PCOPY4 TO 8
239 IF NM<0 THEN 241
240 QX=110:QY=20:VB=0:VC=1:CX=50:CY=140:GOTO 194
241 FORY=QY TO 192 STEP10
242 PUT(QX,Y)-(QX+20,Y+20),QB,PSET:SOUNDY+1,1:PCOPY5 TO 1:PCOPY6 TO 2:PCOPY7 TO
3:PCOPY8 TO 4
243 NEXTY
244 PLAY"T22505CDEFGABO4CDEFGABO3CDEFGABO2CDEFGABO1CDEFGABO1CDEFGABO2CDEFGABO3CD
EFGABO4CDEFGABO5CDEFGAB"
245 PCLS:FORX=0 TO 180 STEP10
246 PUT(X,120)-(X+20,140),CO,PSET:PUT(200,120)-(220,140),QB,PSET:SOUNDX+1,1:PCLS
247 NEXTX
248 FORT=20 TO 1 STEP-1
249 PUT(200,120)-(200+T,120+T),QB,PSET
250 SOUNDT*10,1
251 NEXTT
252 PLAY"T25504CDEFGABO5CDEFGABO4CDEFGABO5CDEFGABGFDEDFGACDEFAGBGFDFACDEFDAGAGEB
GDFEGAFFDGE"
253 CLS
254 PRINT
255 PRINT"            Q*BERT SAYS:"
256 PRINT
257 PRINT"            *!<$%&')*@+?"
258 PRINT:PRINT"               OH DEAR!"
259 PRINT:PRINT:PRINT
260 SC=A*10000 + B*1000 + C*100 +D*10 +E
261 PRINT" NEVER MIND, YOU SCORED A LARGE"
262 PRINT"            ";SC;"!"
263 IF SC>HS THEN HS=SC:PRINT:PRINT" THAT'S A NEW HIGH SCORE!"
264 PRINT"        HIGH SCORE =";HS
265 IF INKEY$="" THEN GOTO 265
266 PMODE4,1:PCLS:
267 DRAW"BM10,20;C5;R5U5L5U5R5BM+5,+0;C5;R5L5D10R5BM+5,+0;C5;U10R5D10L5R5BM+5,+0
;C5;U10R5D5L5F5BM+5,+0;C5R5L5U5R5L5U5R5"
268 DRAW"BM10,50;C5;D10R5BM+5,+0;C5;R5L5U5R5L5U5R5BM+5,+0;D5F5U10BM+5,+0;R5L5D5R
5L5D5R5BM+5,+0;U10D10R5"
269 A=0:B=0:C=0:D=0:E=0:SC=0
270 LE=1:LINE(0,0)-(65,90),PSET,B
271 NM=3:GOTO 127
272 GOTO 272
273 '
274 PMODE4,5:SCREEN1,1
275 IF PPOINT(120,40)=5 AND PPOINT(110,60)=5 AND PPOINT(130,60)=5 AND PPOINT(100
,80)=5 AND PPOINT(120,80)=5 AND PPOINT(140,80)=5 AND PPOINT(90,100)=5 AND PPOINT
(110,100)=5 AND PPOINT(130,100)=5 AND PPOINT(150,100)=5 THEN 276 ELSE RETURN
276 IF PPOINT(80,120)=5 AND PPOINT(100,120)=5 AND PPOINT(120,120)=5 AND PPOINT(1
40,120)=5 AND PPOINT(160,120)=5 AND PPOINT(70,140)=5 AND PPOINT(90,140)=5 AND PP
OINT(110,140)=5 THEN 277 ELSE RETURN
277 IF PPOINT(130,140)=5 AND PPOINT(150,140)=5 AND PPOINT(170,140)=5 AND PPOINT(
60,160)=5 AND PPOINT(80,160)=5 AND PPOINT(80,160)=5 AND PPOINT(100,160)=5 AND PP
OINT(120,160)=5 AND PPOINT(140,160)=5 AND PPOINT(160,160)=5 THEN 278 ELSE RETURN
278 IF PPOINT(180,160)=5 THEN 279 ELSE RETURN
279 PLAY"T22501CDEO2CDEO3CDEO4CDEO5CDECDECDECDECDEEDC"
280 PMODE4,1:SCREEN1,1:PCLS
281 PUT(140,160)-(160,180),QB,PSET
282 FORDX=10 TO 120
283 PUT(DX,160)-(DX+20,180),CO,PSET
284 NEXTDX
285 PLAY"T605GET10AGT6E"
286 FORUY=160 TO 120 STEP-1
287 PUT(140,UY)-(160,UY+20),QB,PSET
288 LINE(140,UY+21)-(160,UY+21),PSET
289 LINE(140,UY+22)-(160,UY+22),PRESET
290 NEXTUY
291 FORUX=120 TO 140:PUT(UX,160)-(UX+20,180),CO,PSET:NEXTUX
292 FORUY=120 TO 160:PUT(140,UY)-(160,UY+20),QB,PSET
293 NEXTUY
294 PLAY"T503CCCDCDE"
295 LE=LE+1
296 IF LE=10 THEN LE=1
297 B=B+1:IFB=10 THEN A=A+1:IFA=10 THEN A=0
298 PMODE4,1:PCLS
299 DRAW"BM10,15;C5;R5L5D5R5D5L5R5BM+5,+0;R5L5U10R5BM+5,+0;D10R5U10L5R5BM+5,+0;D
10U10R5D5L5F5BM+5,+0;U10R5L5D5R5L5D5R5"
300 DRAW"BM10,50;C5;D10R5BM+5,+0;U10R5L5D5R5L5D5R5BM+5,-5;U5D5F5U10BM+5,+0;R5L5D
5R5L5D5R5BM+5,+0;R5L5U10"
301 LINE(0,0)-(65,90),PSET,B
302 GOTO 127
```



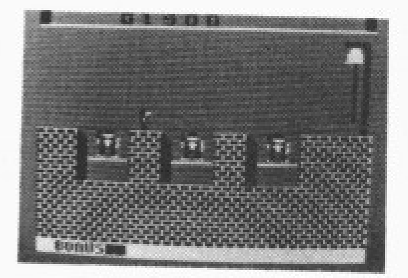



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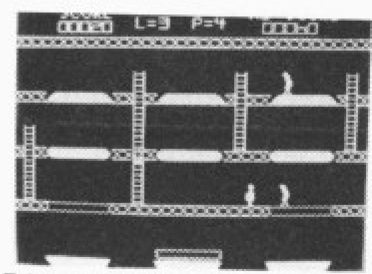
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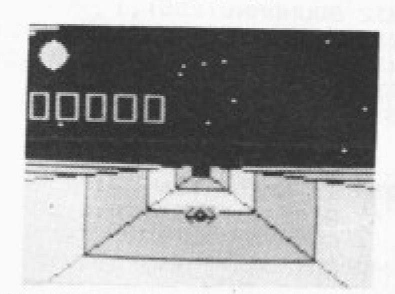
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Reach for recursion

Paul Grieves *introduces programming in recursion*

MANY readers may have heard of the term "Structured Programming" and of how Basic isn't capable of such programming. Structured programming really means "ordered", as the writer notes all the various stages in the production, rather than just throwing some code together.

Experts on the subject often throw scorn on humble Basic criticising it for being unable to support structured programming techniques. However, with a little thought, I believe you can support most ideas. In recent years Pascal has become a popular language because it supports "structured programming". One very interesting feature of Pascal is its ability to support a special type of program structure, called *Recursion.* This is the subject I wish to convert to Microsoft Basic.

Recursion is a very useful and elegant technique to program with. It allows an enormous amount of code to be reduced to just a few lines. In fact, some problems are so difficult that recursion is the only solution.

In order to understand recursion you must first accept the idea of a "variable". This is the name given to a specific address in the computer's memory that is used to perform calculations. Until now the idea was that if a variable is given a value at the start of the program, then in any subroutines it will have the same value. This is easy to implement and is easier to understand.

```
10 DIM S(100)
20 INPUT N
30 V=1
40 GOSUB 1000
50 PRINT N"FACTORIAL
   ="V
60 GOTO 60
1000 IF N=1 THEN
   RETURN
1010 GOSUB 2000
1020 V=V*N
1030 N=N-1
1040 GOSUB 1000
1050 GOSUB 3000
1060 RETURN
2000 'PUSH N
2010 S(X)=N
2020 X=X+1
2030 RETURN
3000 'POP N 3020 N=S(X)
3010 X=X-1  3030 RETURN
```

Listing 1: the factorial routine

However, recursion takes the idea that every program and every subroutine have different variables. That is, if the variable x is used in the program and x is also used in a subroutine, then they are entirely separate. Changing the value of x in the subroutine will have no effect to the x in the main program unless you specifically program it to.

When you look at the structure of the DEF FN instruction you will see this is used there. The variable name used to describe the function isn't affected by using it elsewhere. For example:

10 DEF FNC(A)=SIN(A)*32

Function process

Here the variable "A" is used simply to show how the function is to process its data and not as a specific operation on the contents of "A". Once you have accepted this idea you can proceed to recursion. Recursion uses this idea of "Local Variables" to create its effect. The best way to show this is by the following example.

To find the factorial of a number, it is necessary to multiply itself by one less than the number and by one less than that and so on, until the number is equal to 1. Therefore

FACTORIAL OF N = [IF N = 1 THEN ELSE N * FACTORIAL OF (N-1)]

So if N=4 this is how it works:

FACTORIAL OF 4 = 4 * FACTORIAL OF 3
FACTORIAL OF 3 = 3 * FACTORIAL OF 2
FACTORIAL OF 2 = 2 * FACTORIAL OF 1
FACTORIAL OF 1 = 1
Therefore FACTORIAL OF 4 = 4 * 3 * 2 * 1 = 24

In order to solve this problem, you can use recursion and so need a language that will allow you to call a subroutine from within itself without destroying the data it holds. That is, the routine FACTORIAL needs to call itself but it mustn't destroy N.

Since Basic does not support "local variables" programmers must do this themselves by using an *array* as a form of store. Here, whenever the routine is called, its data is stored in a specific section of the array, then a pointer is moved to another section. This continues until it is time to return from the routine. When this happens, the pointer is moved back to its last lot of data which is then removed. The removal of data continues until the array is empty. This supports the "local variables" and Basic itself will support the repeated call upon a subroutine.

Type in the simple statement below and run it:

10 GOSUB 10

After a few seconds you will get the message "OM — ERROR", the "Out of Memory" error. This is because the statement has called itself continuously. When a subroutine is called, the position in memory it is called from is saved so that when the routine ends it can return to that point and continue on. Therefore, this statement keeps saving its return address until there is no more room left. This shows that Basic can call a subroutine from within itself.

With this information you can now type in Program listing 1 which is the factorial routine. Here N is the number typed in and V is the value of the factorial. Subroutine 1000 is the Factorial part, routine 2000 saves or "pushes" the variable N into storage and routine 3000 restores or "pops" it back out.

Once this is understood, recursion can be used to create really impressive results. Type in program number 2 and run it. Here, the program first draws a circle on the text screen and then paints it. This routine is handy for low resolution graphics as it is quite quick to type in and is very accurate at filling in a shape.

It works by calling a subroutine to paint the circle at a certain x,y location. The routine first checks if the x,y is in range, if it isn't then it will end. Then the point selected is tested to see if it has already been painted. If it has, then again the routine will return. Once past this point the routine will set the x,y location and will see if it can paint first in the east direction then south, west and finally north.

Since the x,y values are only changed by adding or subtracting 1, there is no need to save them as they can be restored when the routine returns by reversing the addition or subtraction. The routine seems to stop once the shape has been painted, however, the program is still ▶

```
10 CLS0
20 C=5
30 GOSUB 1000
40 X=32:Y=16
50 GOSUB 2000
60 SOUND 100,10
70 GOTO 70
1000 ' CIRCLE ROUTINE
1010 ' C=COLOUR OF CIRCLE
1020 '
1030 V=180/(ATN(1)*4)
1040 DEF FNR(D)=D/V
1050 DEF FNX(D)=31+16*SIN
     (FNR(D))
1060 DEF FNY(D)=16-11*COS
     (FNR(D))
1070 FOR D=0 TO 360 STEP 3.5
1080 SET(FNX(D),FNY(D),C)
1090 NEXT D
1100 RETURN
2000 'PAINT ROUTINE
2010 ' (X,Y) = START POINT
2020 ' C=COLOUR TO PAINT
2030 '
2040 IF X>63 OR X<0 OR Y>31 OR
     Y<0 THEN RETURN ELSE IF
     POINT(X,Y)=C THEN RETURN
2050 SET(X,Y,C)
2060 X=X+1:GOSUB 2000:X=X-1
2070 Y=Y+1:GOSUB 2000:Y=Y-1
2080 X=X-1:GOSUB 2000:X=X+1
2090 Y=Y-1:GOSUB 2000:Y=Y+1
2100 RETURN
```

Listing 2: a circle is drawn and painted

```
10 CLS:CLEAR 1000
20 DIM A$(30),A(30),B(30)
30 INPUT "PLEASE ENTER YOUR WORD ";L$
40 I=1:N=LEN(L$):V=1
50 FOR T=1 TO N:V=V*T:NEXT T
60 CLS
70 PRINT "THERE ARE "V" POSSIBLE"
80 PRINT "WAYS TO WRITE "L$
90 P=1
100 IF N>(P-1) THEN P=P*2:GOTO 100
110 P=P-N
120 SO$=L$
130 GOSUB 1000
140 END
1000 IF I<>N THEN 1050
1010 MID$(SO$,N,1)=MID$(L$,N,1)
1020 PRINT SO$;STRING$(P,128);
1030 GOSUB 4000
1040 RETURN
1050 FOR J=I TO N
1060 GOSUB 2000
1070 MID$(SO$,I,1)=MID$(L$,I,1)
1080 GOSUB 3000
1090 I=I+1:GOSUB 1000
1100 IF J>N THEN GOSUB 4000:GOTO 1100
1110 NEXT J
1120 RETURN
2000 'SWAP L$ (I,J)
2010 T$=MID$(L$,I,1)
2020 MID$(L$,I,1)=MID$(L$,J,1)
2030 MID$(L$,J,1)=T$
2040 RETURN
3000 'PUSH I,J,L$
3010 A(X)=I:B(X)=J:A$(X)=L$
3020 X=X+1
3030 RETURN
4000 'POP I,J,L$
4010 X=X-1
4020 I=A(X):J=B(X):L$=A$(X)
4030 RETURN
```

Listing 3: presented for use rather than understanding

running until you hear a loud buzz. This is because the program has to check all of the shape to ensure it has filled it all in correctly.

The program can be speeded up by erasing the part of line 2040 that checks if the x and y values are in range. This is only advisable if you are certain that the shape will not leak the paint out. If it does leak then this line must exist or an error will occur.

The final listing (program 3) is very difficult to explain as it is heavily involved with Recursion and so I merely present it for your use if not for your understanding. It is a better version of the various programs used to find the permutations of various letters and numbers.

Each permutation is given, rather than a random cross sample dependant on the RND function. It will accept quite large lines, that is, the entire alphabet, but it takes a great deal of time to go through more than about 5 or 6 characters.

There are many textbooks available that discuss recursion (see panel) and I suggest that you refer to these if you want to try any further experiments. Even if you don't understand this topic you can still use the "Paint" and "Permute" routines in your own programs. ■

Pascal, An introduction to Methodical Programming by W Findlay and D A Watt (Pitman)
Inside the Dragon by D Smeed and I Sommerville (Addison-Wesley)
Computer Science: A modern introduction by Goldschlager and Lister (Prentice-Hall)
A structured programming appraoch to data by D Coleman (Macmillan Press)

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Stitchet

From Graham Smith in Bristol

THIS IS a short program to produce an interesting circle stitching pattern. My daughter enjoyed typing in a similar type of program which produced a rectangular based pattern, I therefore produced this totally different program of similar length to maintain her interest. At present the shorter and simpler programs are much in demand by my children.

```
10 DIM X(30),Y(30)
20 P=0:C=0:D=0:E=2:F=0
30 FOR N=1 TO 18:P=P+20
40 X(N)=INT(122+(95*COS(P/(180/3.1
42))))
50 Y(N)=INT(96-(95*SIN(P/(180/3.14
2))))
60 NEXT
70 PMODE4,1:SCREEN1,D:PCLS
80 IF F<2 THEN PCLS
90 C=C+1:IF C=10 THEN 150
100 A=0:B=C
110 A=A+1:IF A=19 THEN GOTO 190
120 B=B+1:IF B=19 THEN B=1
130 LINE(X(A),Y(A))-(X(B),Y(B)),PS
ET
135 PLAY"T10005B04B03B02C"
140 GOTO110
150 C=0:E=E+1:IF E=5 THEN D=1
160 IF E=8 THEN E=2:D=0:C=0
170 F=F+1:IF F=4 THEN F=0
180 GOTO 70
190 FOR I=1 TO 10:PLAY"T10002CDEFG
ABAGFEDC":NEXT:GOTO 80
200 REM *70* CHANGE PMODE TO 3
210 REM *80* ADD E AFTER PCLS
```

Sound

From R Strange in Cornwall

THIS PROGRAM makes good use of the Dragon's AUDIO command to produce a colourful display synchronised to the changes in a piece of music. You can use a cassette tape or feed the output of a Hi-Fi system into the cassette input. Some cassette recorders output an amplified signal on their earphone output when set to record so you can even use a microphone as a sound source.

The program also demonstrates the use of USR calls to pass parameters between Basic and machine code. The first call simply counts the number of transitions on the cassette input, IC35 PORT AO, in a time interval given by parameter T, the count being returned to variable A. After waiting for a significant change in pitch, a colour is chosen according to the value of A and two more user subroutines are used to shade one quarter of the text screen.

High frequency noise will ruin the effect, so a fairly "clean" sound input is required.

Program notes

10-30	Clear screen, turn on cassette sound and reserve machine code space.
40-50	Machine code to read the cassette.
60-70	Machine code to colour the next quarter of the screen down.
80-90	Machine code to colour the next quarter of the screen up.
100-120	Initialise machine code, start tape and set up count period.
130-180	Read signal, modify T to accommodate to the signal and loop if the pitch has not changed much.
190	Select colour, roughly in order of luminosity.
200	Colour the screen, moving upwards for increasing pitch, downwards for decreasing pitch.
210-220	Tidy up and loop.
230-240	Poke machine code.

```
1 ' ********************
2 ' ** SOUND-TO-LIGHT **
3 ' **              **
4 ' ** ROBERT STRANGE **
5 ' ** <C>  AUG  1984 **
6 ' ********************
10 CLS0
20 AUDIO ON
30 CLEAR200,19999:A=20000
40 DEF USR0=A:GOSUB230
50 DATA BD,8B,2D,1F,1,5F,B6,FF,20,
91,FE,27,1,5C,97,FE,30,1F,26,F2,4F
,7E,8C,37,*
60 DEF USR1=A:GOSUB230
70 DATA BD,8B,2D,9E,FC,8C,6,0,26,3
,8E,4,0,86,80,E7,80,4A,26,FB,9F,FC
,39,*
80 DEF USR2=A:GOSUB230
90 DATA BD,8B,2D,9E,FC,30,89,FF,0,
8C,4,0,24,3,8E,5,80,86,80,E7,80,4A
,26,FB,9F,FC,39,*
100 POKE&HFC,4:POKE&HFD,0
110 MOTORON
120 T=5000
```

Continued on page 35

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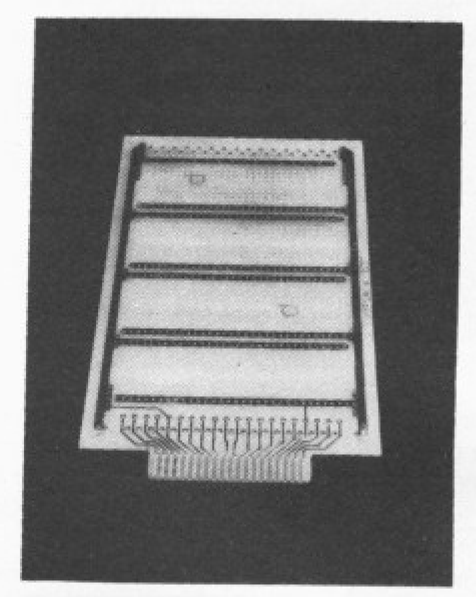
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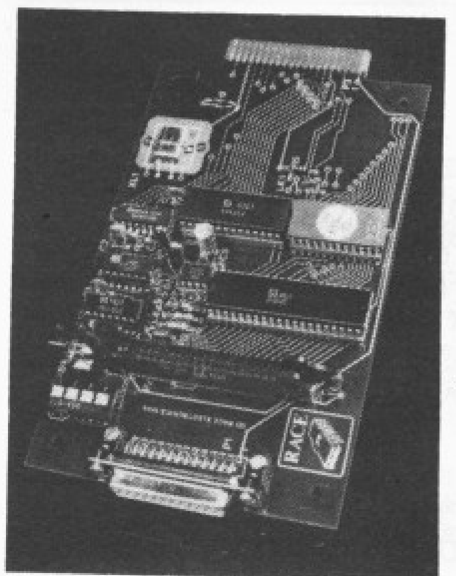
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N.B. This joystick is of the switching type and will work with most games.

```
130 A=USR00(T)
140 C=INT(A/16)
150 IF C=0 THEN T=T*1.1
160 IF C>=8 THEN C=8:T=T*.9
170 IF T>30000 THEN T=30000
180 IF ABS(A-E)<20 THEN 130
190 D=VAL(MID$("128,191,175,239,22
3,143,255,159,207",C*4+1,3))
200 IF A>E THEN D=USR02(D) ELSE D=
USR01(D)
210 E=A
220 GOTO130
230 READ D$:IF D$<>"*" THEN POKE A
,VAL("&H"+D$):A=A+1:GOTO230
240 RETURN
250 '
260 ' NOTES ON MACHINE CODE
270 '
280 ' JSR $8B2D CONVERTS THE
290 ' BASIC NUMERIC VARIABLE
300 ' TO AN INTEGER IN THE
310 ' D-REGISTER.....
320 '
330 ' JMP $8C37 CONVERTS THE
340 ' VALUE IN THE D-REGISTER
350 ' TO A BASIC VARIABLE AND
360 ' RETURNS TO BASIC.....
```

Ski-run

From Michael Oliver of North Yorkshire

SKI-RUN is a game for one player. When RUN, the computer will print out the instructions, they you will have to wait for about 3 minutes for the computer to set up the screen in PMODE4. The program takes up approximately 16K of memory.

The idea of Ski-Run is to guide a skier from the top of a ski slope to the bottom. You have a set course to follow and you have to keep between the flags. You get four lives to start with and you lose one of them when you crash into a flag.

The cursor keys are used for moving the skier in the appropriate direction. When an arrow key is pressed, the skier will automatically travel in that direction until another cursor key is pressed.

The data statements between lines 140 and 370 consist of a number between one and three. Number one prints a fir tree on the screen, number 2 a flag and 3 a patch of snow on the screen.

Program notes

Lines	
10-660	The procedure for setting up the screen.
140-370	The data for printing the screen.
670-1110	The main routine for the game.
990-1020	The procedure for when the game has ended.
1030-1110	The procedure for when the player has won.
1120-1170	Title page.
1180-1390	Instructions.

Variables

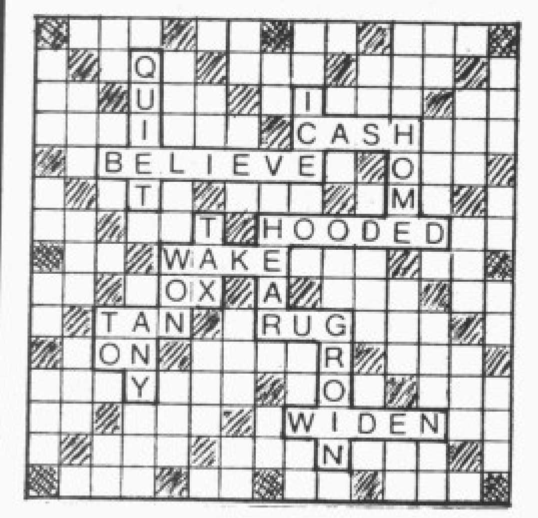
CHAR	The character.
SCREN	The variable to set up the screen.
CK	Checks the screen for collisions.
LIFE	How many lives you have left.
XX	The old position of the skier. (The "X" coordinate).
YY	The old position of the skier. (The "Y" coordinate).
X	The updated position of the skier.
Y	The updated position of the skier.
TM	The time it has taken you.
HT	The fastest time.

```
10 DIM CHAR(4,8),SCREN(32,24)
20 DIMCK(32,24)
30 REM DOWNHILL SKI-ING
40 REM (C) 2/6/1984
50 GOSUB 1180
60 CLS
70 PRINT @ 135,"setting up screen"
80 PRINT
90 PRINT TAB(10);"PLEASE WAIT"
100 PRINT:PRINT TAB(5);"3 MINUTES,
 15 SECONDS"
110 REM
120 REM DATA FOR PRINTING OUT THE
      SKI RUN
130 REM
140 DATA 1,1,1,1,1,1,1,1,1,2,1,1,1
,1,1,1,2,1,2,1,1,1,1,1,1,2,1,1,1,1
,1,1
150 DATA 1,2,1,1,1,1,1,1,2,3,2,1,1
,1,2,2,3,2,3,2,1,2,2,1,2,3,2,1,1,1
,1,1
160 DATA 1,3,2,1,1,1,2,2,3,3,3,2,2
,2,3,3,3,3,3,3,2,3,3,2,3,3,3,2,1,1
,1,1
170 DATA 1,3,3,2,2,2,3,3,3,3,3,3,3
,3,3,3,3,3,3,3,3,3,3,3,3,3,3,3,2,1
,1,1
180 DATA 1,3,3,3,3,3,3,3,3,2,3,3,3
,3,3,3,2,3,2,3,3,3,3,3,3,2,3,3,3,2
,1,1
190 DATA 1,2,3,3,3,3,3,3,2,1,2,3,3
,3,2,2,1,2,1,2,3,2,2,2,2,3,3,3,2,1
,1,1
200 DATA 1,1,2,3,3,3,2,2,1,1,1,2,2
,2,1,1,1,1,1,1,2,1,1,2,3,3,3,2,1,1
,1,1
210 DATA 1,1,1,2,2,2,1,1,1,1,1,1,1
,1,2,1,1,1,1,1,1,1,2,3,3,3,2,1,1,1
,1,1
220 DATA 1,2,2,1,1,1,2,2,2,1,1,1,2
,2,3,2,1,2,1,1,2,2,3,3,3,2,1,1,1,1
,1,1
230 DATA 2,3,3,2,1,2,3,3,3,2,1,2,3
,3,3,3,2,3,2,2,3,3,3,3,2,1,1,1,1,1
,1,1
240 DATA 2,3,3,3,2,3,3,3,3,3,2,3,3
,3,3,3,3,3,3,3,3,3,3,2,1,1,1,1,1,1
,1,1
250 DATA 2,3,3,3,3,3,3,3,3,3,3,3,3
,3,2,3,3,3,3,3,3,3,2,1,1,1,1,1,1,1
,1,1
260 DATA 2,3,3,3,3,3,2,2,2,3,3,3,2
,2,1,2,3,2,3,3,2,2,1,1,1,1,1,1,1,1
,1,1
270 DATA 2,3,3,3,3,2,1,1,1,2,3,2,1
,1,1,1,2,1,2,2,1,1,1,1,1,1,1,1,1,1
,1,1
280 DATA 2,3,3,3,2,1,1,1,1,1,2,1,1
,1,1,1,1,1,1,1,1,1,1,1,2,1,1,1,1,1
,1,1
```

Continued on page 37

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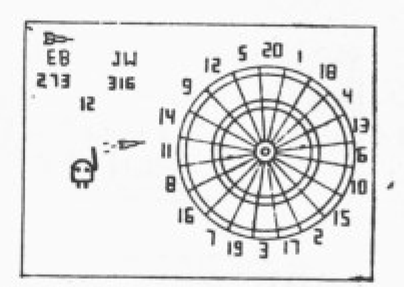


LINKWORD

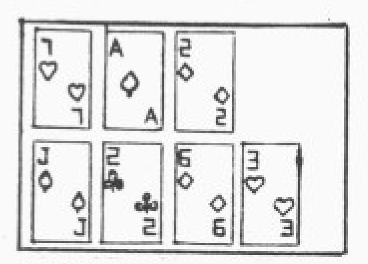
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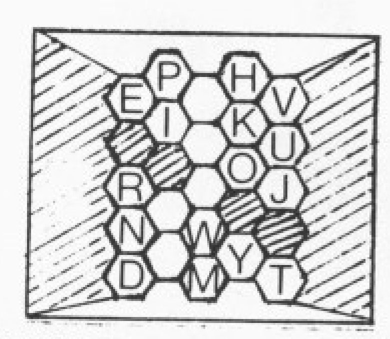


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```
290 DATA 1,2,3,3,3,2,1,2,2,1,1,1,1
,1,1,1,1,1,1,1,1,1,1,2,3,2,1,1,2,2
,2,2
300 DATA 1,2,3,3,3,3,2,3,3,2,1,1,1
,1,1,2,1,1,1,1,1,1,2,3,3,3,2,2,3,3
,3,3
310 DATA 1,1,2,3,3,3,3,3,3,3,2,1,2
,1,2,3,2,1,1,1,1,2,3,3,3,3,3,3,3,3
,3,3
320 DATA 1,1,1,2,2,3,3,3,3,3,3,2,3
,2,3,3,3,2,2,3,2,3,3,3,2,3,3,3,3,3
,3,3
330 DATA 1,1,1,1,1,2,3,2,2,3,3,3,3
,3,3,3,3,3,3,2,3,3,3,2,1,2,3,3,2,2
,2,2
340 DATA 1,1,1,1,1,1,2,1,1,2,3,3,3
,3,3,2,3,3,3,3,3,3,2,1,1,1,2,2,1,1
,1,1
350 DATA 1,1,1,1,1,1,1,1,1,1,2,3,2
,3,2,1,2,3,3,3,3,2,1,1,1,1,1,1,1,1
,1,1
360 DATA 1,1,1,1,1,1,1,1,1,1,1,2,1
,2,1,1,1,2,2,3,2,1,1,1,1,1,1,1,1,1
,1,1
370 DATA 1,1,1,1,1,1,1,1,1,1,1,1,1
,1,1,1,1,1,1,2,1,1,1,1,1,1,1,1,1,1
,1,1
380 REM STORE ALL DATA IN A 32*
      24 ARRAY
390 FOR Y=0 TO 23
400 FOR X=0 TO 31
410 READ A
420 SCREN(X,Y)=A
430 CK(X,Y)=A
440 A=0:NEXT X,Y
450 REM SET UP CHARACTERS
460 DATA 239,231,199,195,131,0,239
,255
470 DATA 143,179,188,179,143,159,1
59,255
480 DATA 255,255,255,255,255,255,2
55,255
490 DATA 239,131,69,69,215,187,187
,57
500 FOR CH=1 TO 4
510 FOR B=0 TO 7
520 READ C
530 CHAR(CH,B)=C
540 NEXT B,CH
550 GOSUB1120
560 REM SET UP SCREEN IN PMODE4
570 PMODE 4,1:PCLS5
580 FOR Y=0 TO 23
590 FOR X=0 TO 31
600 A=SCREN(X,Y)
610 PLAY"T255O5":PLAY STR$(A)
620 FOR B=0 TO 7
630 POKE 1536+(Y*256)+(B*32)+X,CHA
R(A,B)
640 NEXT B
650 NEXT X,Y
660 PCOPY 5 TO 8
670 HT=4E4
680 CLS:PRINT:PRINT"PRESS spacebar
 TO START THE GAME"
690 IF INKEY$<>" "THEN 690
700 PRINT:PRINT:PRINT TAB(10);"goo
d  luck";
710 FOR A=1 TO 3:PLAY"O3T255CEDCED
CEDDFEDFEDFEGBAGBA":NEXT A
720 REM****GAME****
730 TIMER=0
740 FOR LIFE=4 TO 1 STEP-1
750 PMODE 4,1:SCREEN 1,1:PCOPY 5 T
O 8
760 X=2:Y=4
770 XMV=0:YMV=0
780 XX=X:YY=Y
790 A$=INKEY$
800 IF A$=CHR$(8) THEN XMV=-1:YMV=
0
810 IF A$=CHR$(9) THEN XMV=1:YMV=0
820 IF A$=CHR$(94) THEN YMV=-1:XMV
=0
830 IF A$=CHR$(10) THEN YMV=1:XMV=
0
840 X=X+XMV
850 Y=Y+YMV
860 IF X=32 AND Y>16 THEN GOTO 103
0
870 IF CK(X,Y)<>3 THEN 940
880 FOR B=0 TO 7
890 POKE 1536+(Y*256)+(B*32)+X,CHA
R(4,B)
900 POKE 1536+(YY*256)+(B*32)+XX,2
55
910 NEXT B
920 GOTO 780
930 GOTO 930
940 FOR B=0 TO 7
950 POKE 1536+(YY*256)+(B*32)+XX,2
55
960 NEXT B
970 PLAY"O1T10BAGFEDC"
980 NEXT LIFE
990 PLAY"P1P1T3O2L2CL4CL12CL2CL4D#
L8DL4DL8CL4CO1L8BO2L2C"
1000 CLS0
1010 PRINT @ 139,"game"+STRING$(2,
128)+"over";
1020 FOR A=1 TO 2000:NEXT A:GOTO 6
80
1030 FOR B=0 TO 7:POKE 1536+(X-1)+
(Y*256)+(B*32),255:NEXT:FOR A=1 TO
 5:PLAY"O5T255CDEFGAB":NEXT A
1040 CLS
1050 PRINT:PRINT TAB(9);"you have
made it"
1060 TM=INT(TIMER/50)
1070 PRINT"YOUR TIME IS";TM;"SECON
DS"
1080 IF TM<HT THEN HT=TM
1090 PRINT"FASTEST TIME";HT;"SECON
DS"
1100 FOR A=1 TO 5000:NEXT A
1110 GOTO 680
```

Continued on page 39

```
1120 CLSO
1130 PRINT @ 140,"ski"+STRING$(2,1
28)+"run";
1140 PRINT @ 207,"by";
1150 PRINT @ 265,"michael"+CHR$(12
8)+"oliver";
1160 SCREEN 0,1
1170 RETURN
1180 CLS
1190 PRINT TAB(7);STRING$(18,"=")
1200 PRINT TAB(7);"WELCOME TO ski
run"
1210 PRINT TAB(7);STRING$(18,"=")
1220 PRINT:PRINT"      THE IDEA OF
ski run IS TO  GUIDE A SKIER FROM
THE TOP OF A HILL TO THE BOTTOM."
1230 PRINT:PRINT TAB(9);"SOUNDS EA
SY?"
1240 PRINT:PRINT"      NOT IF YOU
HAVE A CERTAIN COURSE TO FOLLOW AN
D YOU HAVE TOKEEP BETWEEN THE FLAG
S."
1250 PRINT @ 456,"press spacebar";
1260 SCREEN 0,1
1270 IF INKEY$<>" "THEN 1270
1280 FOR A=2 TO 4:SOUND A*50,1:NEX
T A
1290 CLS
1300 PRINT:PRINT:PRINT"      USE TH
E FOUR ARROW KEYS TO MOVE THE SKIE
R. WHEN YOU PRESS  AN ARROW KEY, T
HE MAN WILL       TRAVEL IN THE SAM
E DIRECTION    UNTIL ANOTHER KEY I
S PRESSED."
1310 PRINT"      YOU HAVE FOUR LIVE
S TO DO  AS BEST AS YOU CAN."
1320 PRINT @ 456,"press spacebar";
1330 SCREEN 0,1
1340 IF INKEY$<>" "THEN 1340
1350 FOR A=2 TO 4:SOUND A*50,1:NEX
T A
1360 CLS:PRINT @ 139,"good"+STRING
$(2,128)+"luck"
1370 PRINT @ 200,"(YOU'LL NEED IT)
"
1380 FOR A=1 TO 5:PLAY"O5T255CFABE
DGFCBACFEDA":NEXTA:FOR A=1 TO 3000
:NEXTA
1390 RETURN
```

Ultra utility

From R Fielding in Hants

THIS is a short utility which will help Ultradrive users. The ability to use the DIR function within a program enables a print-out of the directory to be obtained. (In this case to a GP100A Printer.)

The main part of the listing are lines 120 to 230. These are a text screen dump. (That is converting the data in memory locations &H400 to &H5FF to ASC11 character numbers, then sending characters to the printer in rows of 32 followed by a carriage return.)

I place this program on tape immediately after initialising, making it easy to keep a current record of my data files and programs.

Program notes

Lines 10 to 60 calculate the circular co-ordinates.

Lines 70 to 190 draw the pattern.

Lines 140 and 200 add sound.

Lines 210 to 230 are for colour television.

```
10 '************************
20 '* DIRECTORY TO PRINTER *
30 '* BY    R.H.J.FIELDING  *
40 '************************
50 CLS
52 INPUT"THIS PROGRAMME CATALOGUES AN
   ULTRADRIVE TAPE TO A GP100A      PRINTER
.PRESS enter TO CONTINUE.";K
60 PRINT£-2,CHR$(15)
70 INPUT"TAPE NO";T:INPUT"SIDE";S$
80 PRINT£-2,"TAPE";T,"SIDE ";S$
90 PRINT£-2
100 CLS
110 DIR
120 FORY=0TO15
130 FORX=0TO31
140 P=PEEK(X+32*Y+&H400)
150 IF P<64THEN160ELSE170
160 P=P+96:GOTO200
170 IFP>64ANDP<96THEN200ELSE180
180 IFP>96ANDP<128THENP=P-64
190 IF P=96 THENP=32
200 PRINT£-2,CHR$(P);
210 NEXTX
220 PRINT£-2
230 NEXTY
```

```
TAPE 1          SIDE B

directory
FILENAME TYPE    LEN   START  EXEC
-----------------------------------
DIR       BASIC $0207
STISTICS  BASIC $15BC
RW64      CODE  $20BA $2000 $4000
CGEN64    BASIC $0A2A
END OF FILES
```

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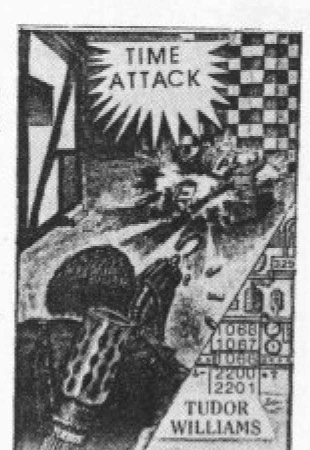
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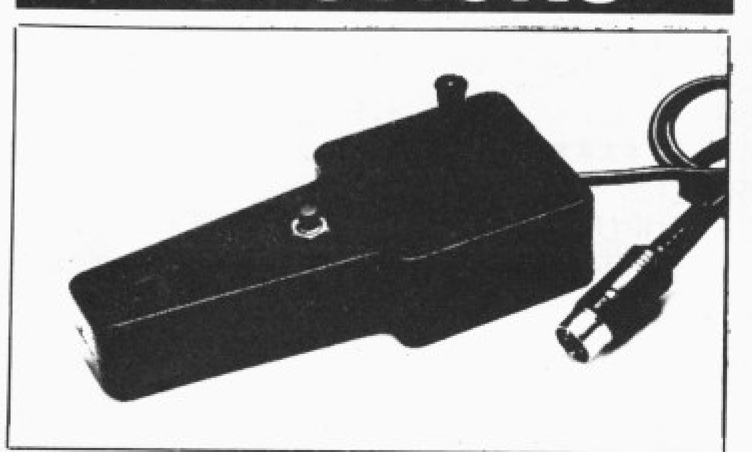
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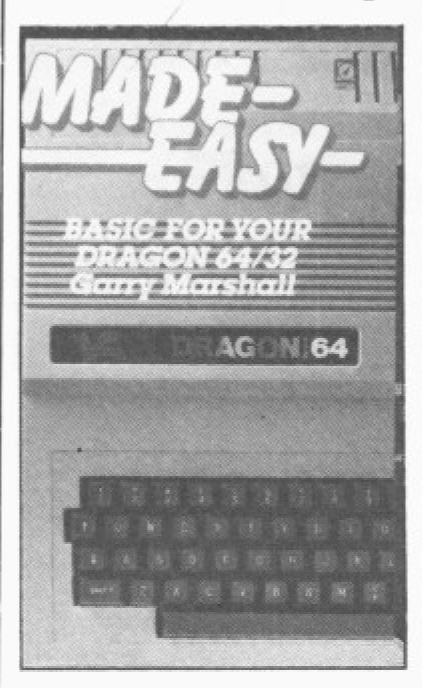
Bookbytes

Send books for review to *Dragon User*, 12-13 Little Newport Street, London WC2H 7PP.

Book: *Basic for your Dragon 64/32 made easy*
Author: Garry Marshall
Publisher: Arrow Books
Price: £3.95

THERE ARE more and more books for the Dragon coming on the market, each looking for a new angle and a new gap to fill. This one is designed to capture the market created by the growing number of Dragon 64 owners. A good number of these are ex-32 owners who have upgraded their micros.

The thin addendum supplied by the manufacturers of the 64 proving inadequate, what is needed is a book exploring the differences between the machines and giving the user some new ideas on utilising the 64's larger memory. Newcomers also need a comprehensive guide to the full Dragon Basic. Unfortunately, this book fails to measure up on both counts.



I could find nothing on the whole book specifically pertinent to the 64. No mention of the use of the auto-repeat facility, nor the use of the RS232 interface. The word EXEC — which puts the machine into 64K mode — does not appear, nor the use of the USR x function now that the bug has been ironed out.

One chapter mentions turtles and robots that you can use with the machine, but the most important accessory for 64 users — a disk drive — and the difficulties caused by the overwriting of the cartridge port in 64 mode get no space.

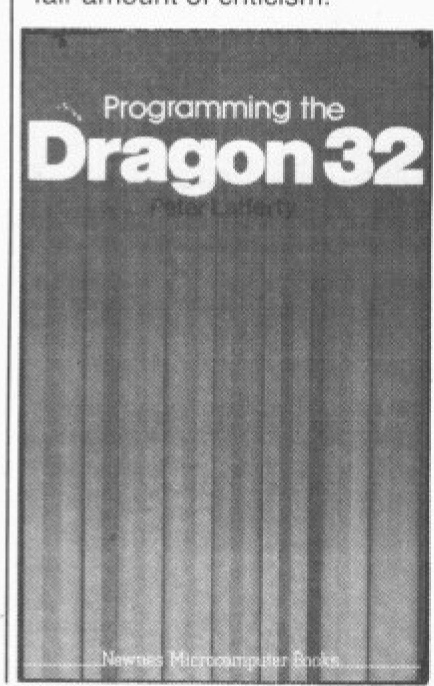
One of the advantages of the increased memory space is that the full run of all hi-res graphics and many pages does not need to be compromised even with very large programs. However, only two pages of the book are devoted to hi-res graphics. This is despite the foreword stating that: "the Dragon 64 (has) . . . impressive graphics and sound production."

Some very elementary Basic can be learnt from this book — but if you've got beyond PRINT, INPUT, READ, DATA and very simple file handling you will be wasting your time with this one. Only 20 statements are covered and the programs given for you to type in — for example a weak "Invaders" game on the text screen — will teach you little.

Mike Harrison

Book: *Programming the Dragon 32*
Author: Peter Lafferty
Publisher: Newnes Microcomputer Books
Price: £6.95

ONE OF the most thankless tasks must be to write the instruction manual which accompanies every microcomputer. To have to acquaint the absolute novice who has just unpacked his first computer, and, at the same time cover the intricacies of the many advanced features of the machine, must be a daunting prospect. It is perhaps inevitable, considering the dual role that these manuals have, that many come in for a fair amount of criticism.



With this in mind, it is a pity that a copy of *Programming the Dragon 32* is not included with every Dragon computer. Here is a clearly written account of how to use the Dragon, starting with the Basic principles, and in which the author never loses track of the fact that the reader might be programming for the first time. This is not to say that the more sophisticated commands are not dealt with, again in a straightforward and easy-to-understand manner. The author is obviously very well acquainted with the Dragon and some of its idiosyncrasies and gives some hints and advice throughout the book that even computer "buffs" might find very useful.

However, it is at the beginner that this book is primarily aimed, and it is packed with both short routines illustrating the effects of the various commands, and also with lots of complete listings (none of them particularly long), covering programs from "space-invaders" and fruit machines to digital clocks and Lissajous curves.

Throughout, it is extremely well-written and informative, and its easy-going style might be said to take the reader on a gentle stroll along the byways of Basic, as opposed to many manuals which appear to make programming resemble an assault on the north face of the Eiger. Definitely a must for all but the "expert".

Gordon Lee

Book: *Creating Adventure Games on your Dragon 32*
Author: Clive Gifford
Publisher: Interface Publications
Price: £5.95

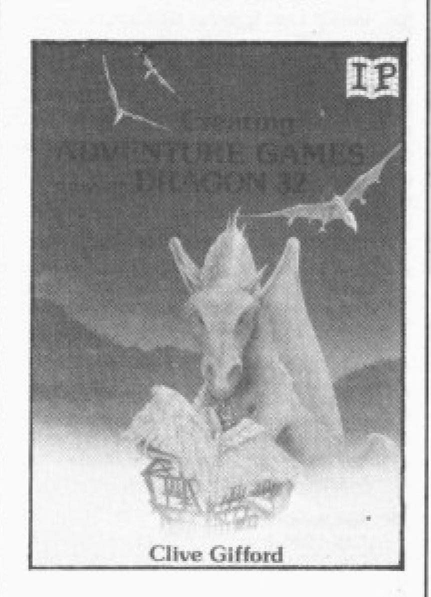
HOW ABOUT setting your next adventure game in your own home?

. . . attacked in porch by milkman . . . run or fight?

. . . spill coffee on carpet . . . move chair or hope it matches wine stain?

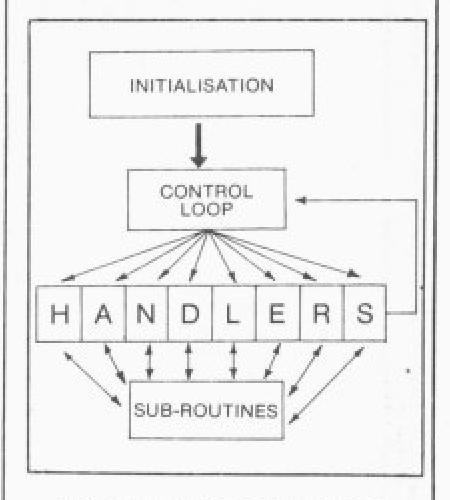
Well, perhaps nothing exciting happens around your house, but imagination can run riot. We now have adult oriented rock, so why not adult oriented adventure — Bo Derek and all. Anything is possible with the help of Clive Gifford's book.

The book not only teaches you how to structure and create adventure games but also how to customise them to your own whims and fancies.



Adventure gaming can offer a real challenge to those tired of alien zapping and this book contains five full programs each of a different type of adventure and each detailed in sections describing their function. As is the strength of this type of game — the whole is so much more than just the sum of the parts.

Clive Gifford's style is to show how four elements in the program: initialisation, the control loop, handlers and the subroutines consequent upon these, interact and can be modified to suit your own ideas. These modules, and a few general purpose ones he also lists, are the key to adventure programming.



The book is easily digested and the listings also include games procedures and techniques and a chapter on how to add sound and graphics to your programs.

Mike Harrison



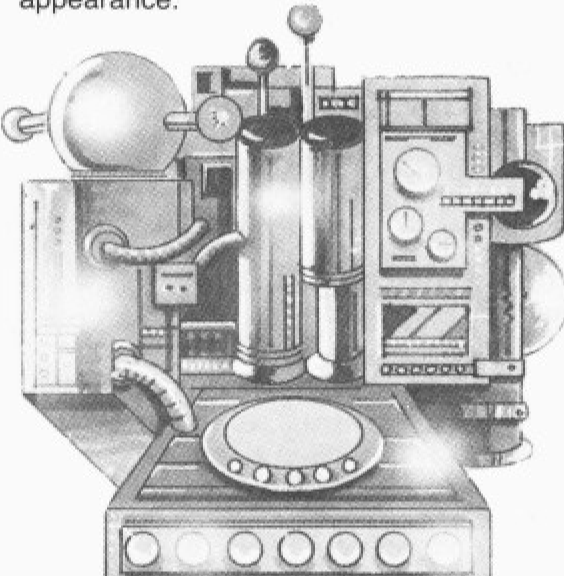
THIS MONTH begins with a plea from reader M A Feakes of Diss in Norfolk, whose daughter was given a copy of El Diablero last Christmas, and Christmas 1984 finds the family Feakes still stuck in this diabolical adventure. The demise of Dragon Data means there's no one they can contact for further clues, and having only so far been able to obtain the Crow, they're anxious for some hints on how to proceed further. This is an adventure I've not seen, so if any readers out there have got beyond the Crow, perhaps they'd let me know and I'll print the clues or pass them on to Distresed of Diss. (Of course, if anyone has a spare copy of the adventure . . .)

Talk of presents too in a letter from a reader in Kent, whose name I won't give as he was asking for advice on adventures he could give his son, whom he describes as a bright nine-year-old. Resisting the temptation to suggest El Diablero, I recommended the various Mysterious Adventures from Channel 8 Software, who are now retailing their titles for £6.95 down from £9.95. I suggested the Mysterious Adventures because they're fairly straightforward, with every object having a purpose, and although it's difficult to know what will suit a particular person, I think the Channel 8 titles would suit that age adventurer.

Also recommended as possible gifts were the four recent Dragon Data graphics adventures: Sea Quest, Calixto Island, Black Sanctum and Shenanigans. Another reader has written in about Calixto Island, which is quite a tricky one, and the letter is interesting because I'm not sure if the reader hasn't been led up the garden path somewhere along the way. R M Redwood of Bristol (you readers are so formal: you are allowed to put your Christian names, you know!) says that "having found the treasure I have been unable to find out where to return it to. At the beginning of the adventure I did not locate the professor's notes, and perhaps these would have contained a clue. Another problem is that having bartered with Trader Jack for the keys he had, I could not then find the teleporter device, which had disappeared from the marshy field in order to return to the professor's study to find out if the keys fitted his desk."

I've a sneaking suspicion that the treasure this reader refers to may be the jewellery that you find fairly early on in the game. The reason for that is that what you want from Trader Jack is the machete, not the keys. You then use the machete to hack a path through the jungle, and later on you find a use for the jewellery, leading on then to enable you to get the main treasure, which is a crown. This you then take back to the professor's laboratory and drop it, to complete the adventure. Don't expect fireworks and razz-a-matazz, though, for like many adventures the ending is rather disappointing . . . you get all that way and then the first thing they ask you is if you want to play again.

In Calixto Island, I haven't located the professor's notes either, but it didn't stop me getting through, and I've never had the experience of losing the transporter device that whisks you from the laboratory to the marshy field. Maybe other readers can shed some light on this mysterious disappearance.



A device of another kind in the Channel 8 series, **Time Machine,** is available for the Dragon 32 and 64 for £6.95, both versions being on the same tape. The cunning program knows which machine you're loading it into and reacts accordingly. The Mysterious Adventures series all work to the same format, and regular readers will be getting as tired of reading what this is as I am of writing it, so we'll give it a miss this month . . . and un-regular readers only have themselves to blame.

All adventures have a maze of some kind, but Time Machine starts you off in one: "I'm in a dense fog on the moors. Exits: NORTH SOUTH EAST WEST." Typing "I" for Inventory informs you that "I'm carrying: Not a sausage!" Fair enough, so nothing to drop but simply trial and error to find your way out of the foggy moor. You can come back later when you are carrying objects and discover the maze is very simply constructed indeed.

The reason you're out on the moors on such a terrible night, instead of sensibly staying indoors and watching "Minder", is that you are an ace news reporter from the Tulkingham and Dunsby Gazette. You've been removed from your usual duties of reporting local flower shows and pensioners' birthdays to investigate strange goings-on at the deserted house on the moors. Having seen plenty of B-movies you should have more sense, but local people have seen strange lights and heard weird noises, so off you go to discover what the eccentric Dr Potter is up to.

From the moor you can make your way to the house, and a doorway containing gloves and a bell. RING BELL, of course, but two dings and two dongs later nothing has happened, so round the corner to find a window. Years of brutal arcade-game playing ensure you don't hang about being all namby-pamby, you SMASH WINDOW (having naturally taken the precaution of wearing the gloves first — we don't get caught like that!). Inside the house you make your way to the cellar, where there's a Strange Machine and a cassette recorder, and the latter provides you with the message: "Find the three prisms that control my machine. Rescue me!"

Now don't worry your head about how someone who's obviously been sent off in a Time Machine can possibly have inserted a message like that in a cassette machine that's been left behind, but instead GO MACHINE to see that there are indeed three empty sockets just awaiting you to INSERT PRISM, not to mention two buttons marked "FOR" and "REV". The quest, then, is on for the prisms, and this will take you via dinosaurs in swamps to sailing brigs and sphinxes — the usual Mysterious fodder, though there seemed to be less in this adventure than in some of theirs . . . or maybe I just haven't got far enough into it yet. If you've tried one before then you'll know what to expect, but if you haven't then I wouldn't particularly recommend starting with this one ■


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Dragon Answers

Character DRAWing

Could you please tell me if there is any other way of moving DRAWed characters, other than using the GET and PUT commands on the high resolution screens. I understand that STR$ works but I don't know how.

Chris Hunt
Beccles
Suffolk

I THINK the method you are referring to is to use the Draw command with variable x,y co-rodinates given using STR$. To draw an image at x,y from the string D$ use the following:

DRAW
"BM"+STR$(X)+","+STR$ (Y)+D$

You can use a similar method to obtain viable colours, angles and scale sizes in the draw command.

Cassette lead

COULD you please tell me where I can purchase a Dragon 32 lead which connects to the cassette recorder. I have tried everywhere in Exeter but no shop stocks them.

Harvey Staddon
Topsham
Exeter

ONCE again the Dragon's similarity to the Tandy Coco pops up, in fact the Dragon's audio cassette lead is identical to the Tandy Coco's. You can get one of these from your local Tandy store for a few pounds, ask for catalogue number 26-1207.

Game error

I OWN a Dragon 64 computer and a few months ago I bought a game called Up Periscope from Beyond. I enjoyed this game so I bought a similar one called Kriegspiel, however, when I loaded this I got a syntax error in line two which was:

2 U=USR 03(0): RETURN

I have had the game replaced several times but I have always had this problem. Please could



you tell me if it is a problem with the Dragon 64 or the game.

Paul McLain
Dunfermline
Fife

ALTHOUGH the Dragon 64 operates as a Dragon 32 when first turned on, there are one or two bugs in the 32K machine which have been removed from the Dragon 64's Basic. One of these is the need to put an additional character before the USR number (in this case the "0"). To get the program to work on your Dragon 64, replace line 2 with:

2 U = USR3(0): RETURN

This is pointed out in the Dragon 64 supplement booklet, but on reflection it would seem better if the bug had been left in the 64's ROM.

Bridge partner

I HAVE noticed a few games for the Dragon 32 for simulated card games such as Crib and Pontoon. Could you please inform me if there is a game of Bridge on the market or if one is in the process of being written. I have tried all the shops in this area without success.

P S Fry
Barnstaple
Devon

DRAGON Data had just released a Bridge game before they ran into difficulty. This program came on cartridge with games on an accompanying cassette. The game can be played with either the keyboard or joysticks.

As with most of Dragon Data's software, the game can now be obtained from Touchmaster, Kenfig Industrial Estate, Margam, Port Talbot, W Glamorgan SA13 2PE. You should order article number H41000. The game costs £15.95 plus £1 post and packing.

Graphics savings

I AM currently writing a graphics program for my Dragon 32 and I read recently that there was a command for saving a graphics page by the use of CSAVEM""

I would be grateful if you could tell me the command and also how to load it back into the computer.

Tim Draper
Lowford
Hants

THE CSAVEM command can be used to save graphics pages quite easily. To save the graphics currently displayed use:

CSAVEM "filename", PEEK(186) *256+PEEK(187), Peek(183)* 256+PEEK(184), 0

This peek's the start and end address of the current graphics selected and saves this block of RAM. If you know the addresses you can use these directly of course, but using this method will also take account of disks and so on.

To reload the graphics, simply use CLOADM "filename". You can specify an offset in the CLOADM command if you don't want the graphics loaded back in the same place.

DeltaDOS or DragonDOS

I OWN a Dragon 32 with a Dragon Data disk system and I am having a great deal of trouble with a file handling system I am trying to write for my father's business.

I have heard that you can buy a separate Delta disk operating system for around £90 and I was wondering whether it would be compatible or could be made compatible with Dragon Data's drives.

W T Alexander
Ingleton
Lancs

THE FILE handling system included with DragonDOS is not particularly user-friendly, but is probably quite capable of doing what you need. You can buy the DeltaDOS from Cumana, which will operate the Dragon Data drives, but this DOS will do no more than DragonDOS, certainly not enough to justify the extra cost. You would do better to invest the money in a professional operating system, such as OS9 or Flex, both of these offer very good file handling. What is really needed is a good book on file handling using DragonDOS, but to my knowledge there aren't any.

Clearing addresses

COULD YOU please help me with the following two questions:

(a) How is it possible to obtain the start, end and exec locations from a file on a "DragonDOS" disk?

(b) Is the ROM "clear-screen" routine available to assembler programs and if so what is its location?

David Reed
Hornchurch
Essex

WITH THE DragonDOS cartridge attached, the following locations contain the addresses you want, MSB first:

1618/1619 = Start address of machine code
1620/1621 = Length of machine code program
1622/1623 = Entry (exec) address

The ROM clear screen routine can be used from assemblers to clear the screen to green, use JSR 47735, and to clear to a particular character, load the "B" register with the code and use JSR 47737. These routines also reset the print position, which is stored in locations 136/137, to the top left of the next screen.

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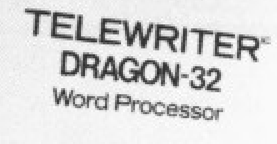
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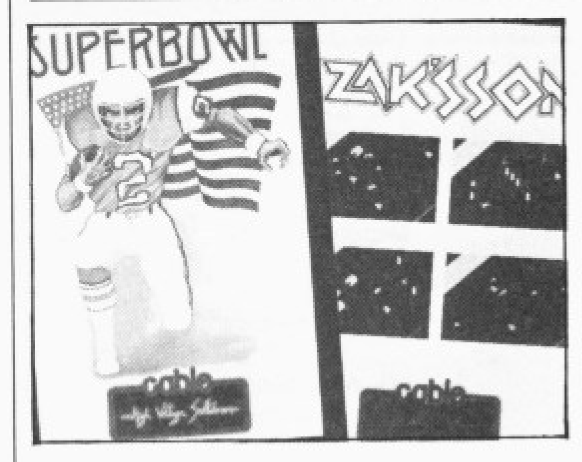
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Competition Corner

Answers to Competition Corner, *Dragon User*, 12-13 Little Newport Street, London WC2H 7PP.



Record space

***Gordon Lee** sets the problem, Cable Software provides the prizes*



THERE are times when an apparently straightforward piece of programming can give rise to problems if one of the basic — though rather eccentric — features of the Dragon is overlooked.

Trigonometry

Take the following simple problem: You wish to determine the height of a flagpole, and find that at a distance of 90 feet, the top of the flagpole has an elevation of 35 degrees from the ground. Elementary trigonometry tells us that the side of a right-angled triangle opposite any given angle (the flagpole) is equal to the *tangent* of that angle multiplied by the side adjacent — in this case the distance along the ground to the flagpole.

So we might type in to the computer:
PRINT TAN (35)*90
This would give us an answer of 42.6433 feet, which we might reasonably suppose is correct. However, there is one important feature of the Dragon — and most other computers — that we have forgotten. This is that all angles handled by the computer *must be given in radians,* not degrees. It is perhaps unfortunate that in a world where the degree is the standard unit of angular measure this should be the case. It is much easier to visualise what is meant by 35 degrees rather than 0.6108652382 radians. Fortunately, it is easy to convert degrees to radians and vice versa.

To convert degrees to radians *divide* by 180/π (approx. 57.29578). To convert radians to degrees *multiply* by 180/π.

Using this fact, the correct height of the flagpole mentioned earlier would be given by:
PRINT TAN(35/57.29578)*90
which gives 63.0186 . . .; the correct answer.

Whilst on the subject of trigonometric ratios, the sine, cosine and tangent of an angle can be accessed directly from the keyboard using the commands SIN, COS and TAN respectively. The inverse of the tangent is also available (ATN) but not, unfortunately, the inverse of either sine or cosine. These can be calculated indirectly from the ATN function using the formulae:
Inverse sine = ATN (X/SQR(1−X*X))
Inverse cosine = 1.570796−(ATN(X/SQR(1−X*X)))

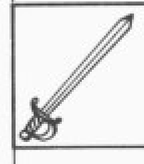
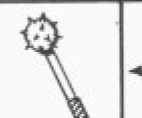
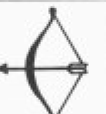
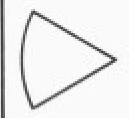
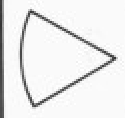
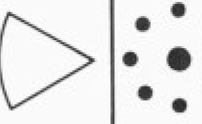
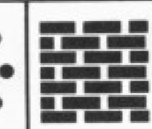
Note that the formulae given in the Dragon manual for these functions are incorrect. Following are some further formulae relating to triangles, which may be found useful. They relate to *any* triangle, the capital letters A, B and C referring to the three angles, and the lower case letters a, b and c the three sides. In each case each side is the one *opposite* the corresponding angle. The letter s in the formulae refers to half the perimeter — that is (a + b + c)/2.

A + B + C = 180 degrees or π radians
a / SIN A = b / SIN B = c / SIN C
area of triangle = √(s*(s−a)*(s−b)*(s−c))
TAN (A/2) = √(((s−b)*(s−c))/s*(s−a)))

Disc table

Here is this month's competition problem: I have two gramophone records, one 12 inches in diameter, and the other one 10 inches. They are lying on a table with the 10 inch disc on top. if this smaller disc is entirely contained within the area of the larger, the area of table covered will be at a minimum (equal to the area of the 12 inch disc), but the area of *overlap* of the two discs will be at a maximum. By sliding the upper disc sideways, the area of the table covered will slowly *increase,* while area of overlap will *decrease.* Eventually, the two discs will lie side by side giving maximum coverage on the table but with *nil* overlap.

At some point during this operation, the area of overlap will be exactly equal to the non-overlapping parts of the discs. **How far apart are the centres when this occurs?** (In solving this problem the records should be regarded as solid discs — no allowance need be made for the two holes in the centres.)■



PAUSE

Prize

CABLE SOFTWARE is offering 10 readers a chance to win its six latest games for the Dragon. The games, distributed by PSL Marketing, usually retail for £6.95 each. They are:

Superbowl — a simulation of American Pro-Football starring Floyd of the Dallas Cowboys. **Quazimodo** — a Hunchback type game with 10 screens and four levels of difficulty. **Zak'sson** — featuring an ace helicopter pilot leading a dangerous mission into Vietnam. **Home Base** — a fight against laser balls and energy bolts. **Eager Edna** — avoid the Troglabytes as you work your way around the maze searching for keys to enter the central chamber. **Fighting Fantasy** — an arcade adventure with 35 different screens and full colour animation.

Rules

TO WIN the software you must show both the answer to the competition and how to solve it. Please do not send in a cassette containing the answer. As a tie-breaker complete the following sentence in 15 words or less: "I want Cable Software's six latest games for my Dragon because . . ."

Your entry must arrive at *Dragon User* by the last working day of January. The winner and the solution to the competition will be published in our April issue. Entries will not be acknowledged and we cannot enter into correspondence on the result.

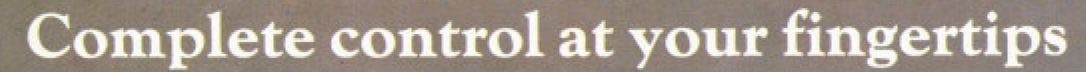
October winner

THE WINNER of the October competition and recipient of £200 worth of software from Salamander is D C Faulkner of Maesycoed in Mid-Glamorgan, who had a score of 42, beating the joint runners-up by one.

St. George now has two choices!

Red or green will slay the Dragon

- Nylon encased-Steel shafted joystick with ball and socket joint.
- Fast sprung return to centre.
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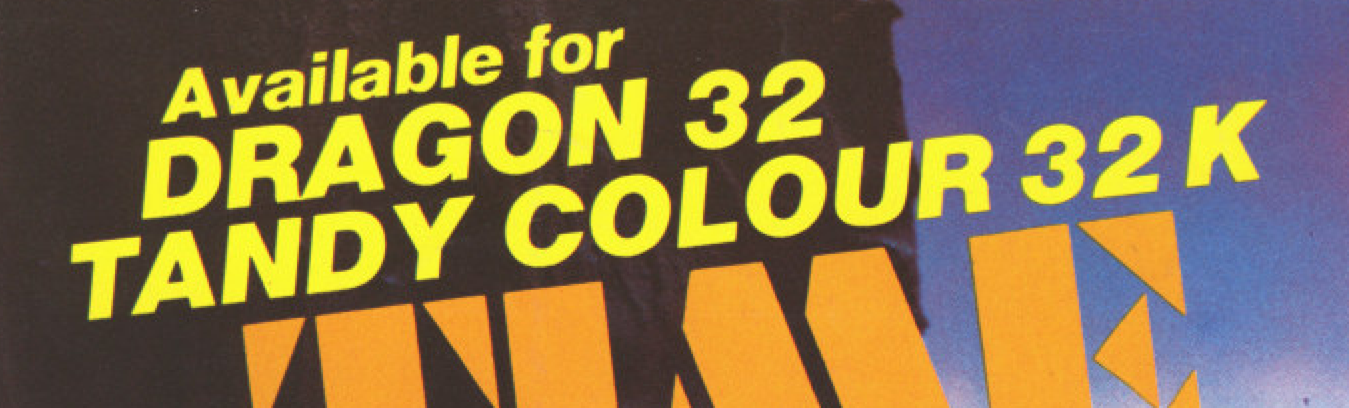
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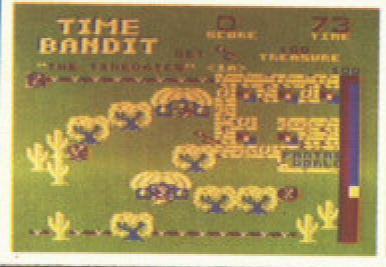


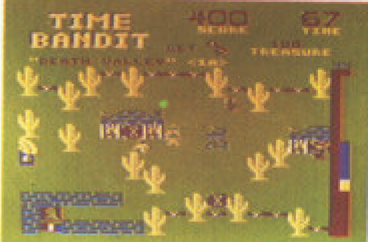
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Tired of games that have only a few screens or force you to follow strict levels? Well despair no more!! In Time Bandit, you virtually create your own game! You can choose from "twenty" places throughout the game, with more than "fifteen" distinct variations and levels of difficulty in each place; this means over 300 different variations!! You must use the "Time-Gates" to travel to each of the 3 different Worlds of Time, each containing a multitude of colourful and unique adventuring areas. Visit the medieval Dungeons of Fantasy World, recapture the days of yesteryear in Western World, and reach for the Stars in Future World. Do battle with the Evil Guardians, Looking Lurkers, Angry Almo, and the Killer Smurphs!! Find the keys and escape with the treasures of time.

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Requires 1 Joystick





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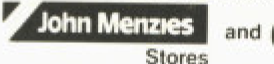
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